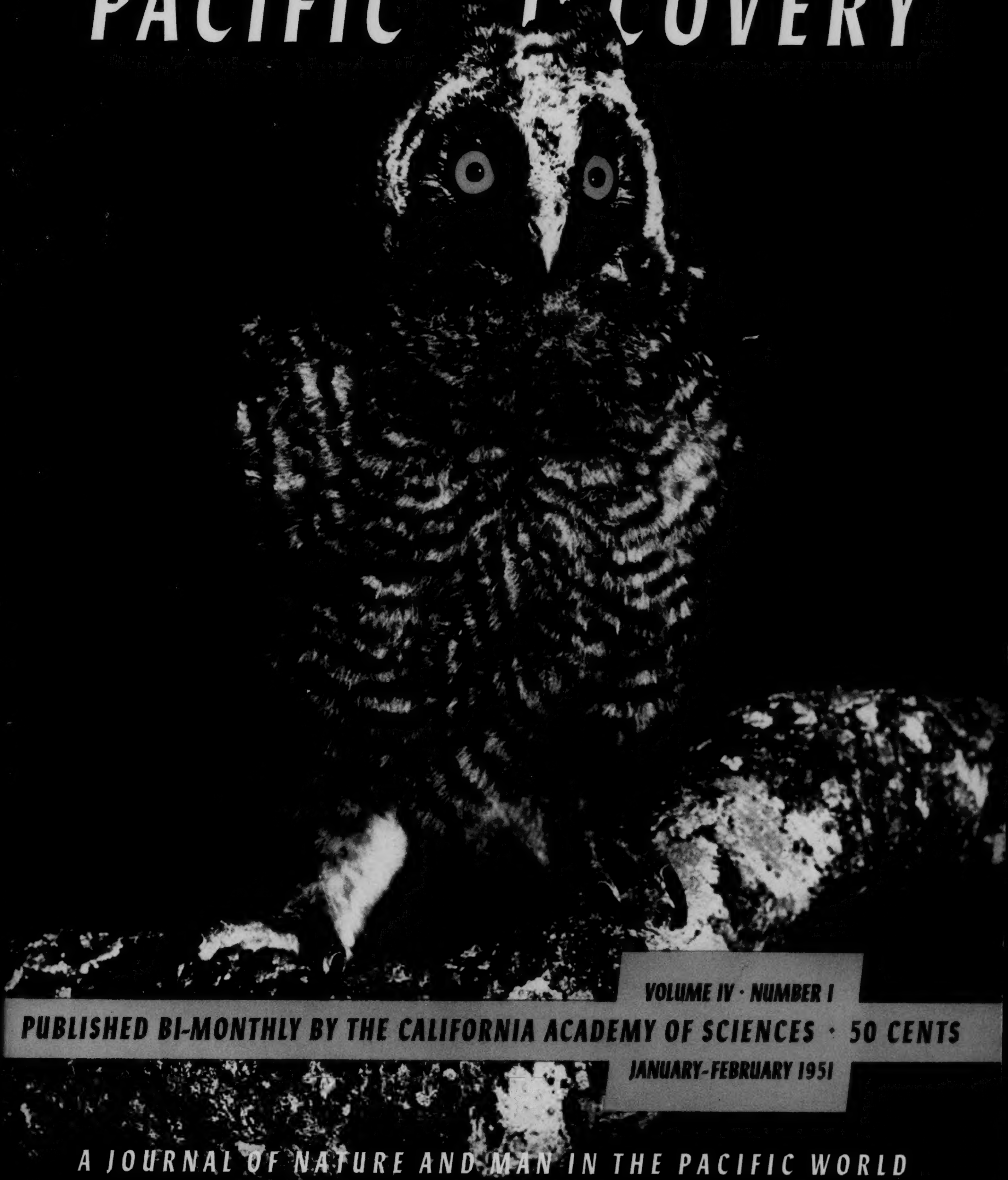
PACIFIC DISCOVERY



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A JOURNAL OF NATURE AND MAN IN THE PACIFIC WORLD

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Founded in 1853

A JOURNAL OF NATURE AND MAN **PACIFIC DISCOVERY** IN THE PACIFIC WORLD

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PRE-DISCOVERY

How should one begin a new year? How but with a fresh look at the world, at one's fellows, at oneself, to seek, in the first and last at any rate, some room for improvement. *PD's* New Year cover bird is still wet behind the ears, and we think he has a very fresh look indeed. By the time he's three, or as old as *PD* is this issue, he should be wise to a thing or two. No owl, *PD* makes no such claim for itself, but if a modicum, only, of wisdom is by-product of the continual effort to compound knowledge of nature and man with the pleasure in reading and pictures we trust you find in these issues, then at least *PD* is not guilty, at three, of a misspent life. You, of course, are always welcome to descend like solicitous aunts and uncles upon *PD's* guardian editors with suggestions and admonitions for the tot's upbringing. Relatives always see room for improvement . . . ¶We highly resolved nothing, come January 1, for fear of surely and shortly hanging by our own resolution. A fine fix we'd be in right now, for instance, had we resolved henceforth to get *PD* to bed early, like a proper three-year-old; or promised never to pre-discover something then not have it in the next issue. The sin of omission is unavoidably upon us, now. Part II of "Chile: Nation With the Long Reach" by C. Langdon White is deferred till March-April so the timely TV script, "The Atom Tomorrow," telecast in December on the Academy show "Science in Action," could be put in print as soon as possible . . . ¶From Chile we shall go westward across most of the Pacific. If the *Kon-Tiki* had not piled up on one of the Tuamotus, it might conceivably have drifted on to "the middle of the earth"—to the Gilbert Islands. Thor Heyerdahl got far enough to support his theory, farther than naval experts thought a raft could take him. Another intrepid anthropologist, Katharine Luomala of the University of Hawaii, got farther on the *Kiakia* than she might reasonably have expected that dubious inter-island tub to take her—all the way from Fiji to tiny Tabiteuea, and with as little comfort and privacy, if not safety, as the six latter-day Vikings enjoyed on their raft. Her "Logbook of a Voyage to the Middle of the Earth," the absorbing story of an anthropologist at work in the remote Gilberts, will be our March-April feature.

DISCOVERING PD'S AUTHORS

After "The Standing Stones of Chiricahua" was set and made up in pages, **Weldon F. Heald** sent us a change of address, from Hereford to Portal, Arizona. We are happy to report that the Healds are now practically next-door neighbors to the Cookes of Chiricahua National Monument—only ten or fifteen miles away instead of a hundred. This writing rancher and mountaineer is co-author of *Inverted Mountains*, a book about the Grand Canyon, and one of the authors of *Sierra Nevada: The Range of Light* . . . ¶Speaking of owls—the birds got away with this issue: cover, Photo Center, and the TV script (with Shorty, the short-eared owl as "Animal of the Week"). It all started when our contributing photographer **Don Bleitz** shipped "Three Familiar Hawks" (*PD* Jan.-Feb. 1950) up from his Hollywood studio, and, as a follow-up soon after, the three owls. And **Dr. Robert Cunningham Miller,** being the nearest available literary ornith*owl*ogist, was forthwith asked to furnish the accompanying copy . . . ¶One of the busiest people on the Academy staff is **Benjamin Draper.** Writing TV scripts, such as "The Atom Tomorrow," for our "Science in Action" series is only one of his means of keeping busy. He also handles Academy press relations . . . ¶National Park Service men such as Yosemite's Park Naturalist, **Donald Edward McHenry,** know that the highest values in the national parks idea can best be learned and diffused via a "Classroom on the Mountain-tops." Yosemite Field Schoolers become " 'ambassadors' for conservation" as well.

D.G.K.

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IN THIS ISSUE

THE COVER COPY

The "Young Long-eared Owl" by Don Bleitz belongs to the trio in "Three Voices of the Night" (p. 12). The other two members appear in Photo Center (pp. 14-15).

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The Atomic Neurosis

IN THE MIDDLE OF THE TWENTIETH CENTURY, at the highest peak mankind has reached in scientific knowledge and technological advancement, we are living in an Age of Fear. And it is not a fear that leads to action, but a gnawing, nagging, corroding fear that leads only to confusion, frustration and discouragement. It is, moreover, a fear for which there is no rational basis.

In the jungle, fear served a biological purpose. The dilation of the pupil of the eye provided better vision to detect an enemy, approaching most commonly under cover of darkness. The prickling along the spine, the increased respiration, blood pressure and heartbeat, with accompanying increase of adrenalin and blood sugar, were evidences of sudden full mobilization of the body's resources, whether for flight or combat.

Today our fear serves no such useful purpose. Unless we are in the armed forces we cannot fight; and we cannot flee, because there is no place to go, and nothing tangible to flee from. So we sit and worry—about whether we should attempt to stem the communism abroad or merely strengthen ourselves against it at home, whether Western Europe can be defended, whether a Germany and a Japan rearmed would be for us or against us, whether Russia really has atomic bombs, and if so, how many. We listen to prophets of doom who tell us that science has gone too far, that civilization is going to destroy itself, that there will have to start again the long, slow upward climb from the lemur and the ape—if indeed there be any apes or lemurs to carry the torch. In short, we succumb to the atomic neurosis.

To quote one writer of recent weeks: "When the bombs begin to explode, there will be no chance to decide what is worth living and struggling for, not even what is worth dying for. There will be no struggle and no fighting, only the instantaneous gasp of death." Happily the same writer works toward a more hopeful view: ". . . the revolution forever ridding the earth of war will come, if it comes at all, as a psychological revolution. It will not succeed if it is prompted solely by the dialectics of fear."

Let us examine what it is of which we are afraid. Is it death? That is the inescapable penalty of being alive. Far from being a product of the atomic age, death is the oldest problem man has had to cope with. Whether bravely or otherwise, he has always faced it, and rather generally he has faced it with calmness and courage. Sophocles, in the fifth century B.C. observed, "Death is not the worst evil." Marcus Aurelius remarked, "Death like birth is a part of nature's wisdom." And Shakespeare, with his genius for expressing the inmost thoughts of men, has Julius Caesar say:

> It seems to me most strange that men should fear;
> Seeing that death, a necessary end,
> Will come when it will come.

Is it then that we are afraid of mass death, as occurred in Nagasaki and Hiroshima? This too is nothing new in human experience. Thirty-six thousand persons perished in the eruption of Krakatoa. In London, in the year 1665, more than 68,000 people died of plague, and two-thirds of the inhabitants of the city fled; but London is still there.

Are we afraid for our wives and children and loved ones? The deaths on American highways since the invention of the automobile have exceeded the deaths in battle through all of our American history. Every time a man takes his wife and children riding on a Sunday afternoon, he takes a greater risk of their being killed than the chance of their being wiped out by an atomic bomb.

Do we fear the destruction of western civilization? Western civilization has been in danger ever since it started. Xerxes almost overwhelmed it twenty-four centuries ago, till he was stopped at Salamis in a naval battle that was the last desperate hope of Greece. Western civilization was twice threatened by Attila the Hun, and again in the 11th century by the Moors, and in the 12th century by Genghis Khan. It had one of its narrowest squeaks when the Christians were being fed to lions, for—though Roman civilization is a major link in our chain of culture—if Roman paganism had succeeded in its effort to snuff out Christianity, the type of civilization we know would not exist. Western civilization has proved its vitality under some pretty rugged conditions. It will continue to survive unless, through defeatism and fear, it loses the will to survive.

Actually we are living today in one of the safest periods of human history. If we were in the period of "the glory that was Greece, and the grandeur that was Rome," most of us past thirty-five would be already dead. Alexander the Great, longing for new worlds to conquer, died at thirty-three. Even at the time of the American Revolution the average length of life was less than forty years. Today in these United States it is somewhere around sixty-eight; and it is highly unlikely that enough atom bombs will ever fall to reduce that average to the ancient level.

This is not an *apologia* for the atomic bomb. We do not consider it among the greater boons that science has provided mankind. But we do not think it is going to destroy civilization. It is just

FROM THE READER

SOUTH CALAVERAS GROVE

Editor, *Pacific Discovery*
Sir:

The cover picture on the November-December *PD* was a splendid representation of two outstanding features of the South Calaveras Grove—the clean brightness of the Big Tree trunks, and the leafy filtering of the sunlight as it works down through layer after layer of forest green. We turned eagerly to the inside of the magazine in search of some text to go with the picture, and would have liked to find more than just the short quote—telling though it is—from Mr. Olmsted's report. Maybe this month's readers will enjoy a follow-up.

It is a roundabout and challenging road that approaches the South Calaveras Grove of Big Trees, and a richly canopied trail that continues into the grove. You enter the presence of the great trees in a mood of adventure and exploration; the appreciation and awe you may experience in this forest today are somehow enhanced by your separation, in space and time, from the mechanized world of artifact. What tomorrow's visitor to the South Grove may find—in physical features and in mood—depends on decisions, soon due, regarding acquisition and policy.

The importance of the physical features of the grove, and of preserving them from destruction, has long been known; only recently, however, have definite steps been taken toward purchasing the property for a state park. The importance of the mood, and of maintaining it, is probably not so well recognized yet; and work toward its preservation will have to continue long after the actual acquisition.

How much of the property is to be purchased, and how it is to be administered, are not yet determined. Both decisions must inevitably be influenced by public opinion, which conservationists and naturalists everywhere hope will be founded on appreciation of what South Grove can mean to people in, say, the year 2051 or 2151.

How much should be saved?

Prospects for acquisition are presently more encouraging than they have been for a long time. The lumber company that owns the land has expressed willingness to sell (though the price is bound to be high), and is generously deferring operations in the Big Tree grove and in some of the choice adjacent areas. The U. S. Forest Service, through the appropriate representative, and the California State Park administrators are considering transfers that will go far toward matching the funds already earmarked by the Park Commission for a Calaveras purchase. The federal-state coöperation is complex, but work is progressing as rapidly as present conditions permit. In theory, at least, all that remains to be done is to raise a considerable sum of money to supplement means already available, and then to negotiate the purchase of the entire Big Tree Creek basin and a portion of the exceptionally fine forest adjoining it. But how much forest? How much money?

Before reflection, one might tend to phrase it, "How much standing timber can we afford to buy for park purposes?" Those who recognize the importance of primeval preserves to recreation would more likely put it, "How much of this resource—the like of which will not be seen again—can we afford *not* to buy now?" The decision must rest ultimately on public subscription, but the recommendations so far made to the Park Commission range from a minimum of a few hundred acres, which contain the Big Tree stand, to a maximum of several thousand acres, which take in all the basin and much of the pine forest northwest of it.

It is hard for officials to know which recommendation to follow, for there are those among their advisors who maintain that the entire stand should be preserved, others who recognize serious financial limitations, still others who consider mature sugar pine forest a bad buy for anybody but a lumberman. It seems to depend on whose opinion you ask. The forestry expert whose lifelong concentration has been on board feet of lumber will tell you that the sugar pines on Beaver Creek (over the ridge from Big Tree Creek) are overmature and ought to be harvested immediately; the implication is that they are all going to fall down in a few years and be replaced forthwith by other species, and that only the Big Trees are worth saving. On the other hand, a forest researcher may suggest that we can encourage sugar pine survival by suppressing firs, *Ribes,* and rodents. Better yet, a botanist will reassure you that, given a chance, the sugar pine will probably outlive our civilization. A naturalist who wants to share with descendants his own wonder in an untouched natural world will tell you that for park purposes the slow succession of dominant species

(Concluded on page 32)

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another weapon—no more important and probably less important than the invention of gunpowder.

So, let's stop worrying. Let's quit moaning and wringing our hands. Let us also give up this silly and hysterical nonsense about underground shelters (a current estimate is that one hundred million dollars will provide shelter underground for one hundred thousand people!). Let us, as we did in the last war, take whatever steps for civilian defense as are reasonable and proper, without distracting us from the more important aim of building up our military strength. Wars are won by action, not by going into hiding.

It is true that if an atom bomb falls within half a mile of you or me—something a good deal less probable than being struck by lightning—we are likely to be killed. But in the meantime, let us not scare ourselves to death waiting for the bomb to fall.

R.C.M.

WELDON F. HEALD

FROM OUR PORCH WE LOOK OUT over a slice of southeastern Arizona and northern Mexico the size of Vermont. Across broad San Pedro Valley below us, wrinkled hills and polychrome mountains roll away to blue ranges on the horizon a hundred miles distant. Some say our panorama is empty—no cities, no factories, little cultivation, and completely devoid of drive-ins and signboards. But hidden in that vast sweep of emptiness are enough interesting and unique places for a lifetime of exploration.

For instance, seventy-two miles away on the eastern horizon a massive granite profile of an Indian looks up into the sky. This is Cochise Head, named for the Apaches' greatest chief; it is the culmination of an incredible maze of fantastic stone pinnacles, spires, turrets, towers and needles. Below the mile-long face is one of the most fascinating areas in the Southwest—geologically, botanically, zoölogically, and scenically there is nothing quite like it anywhere else.

The Indians named the place *Say Yahdesut*—Point of Rocks—and heard the voices of the dead whose spirits lingered there. White men now prosaically call it Chiricahua National Monument, and local chambers of commerce advertise the area as the Wonderland of Rocks. But whatever name you choose, perhaps old-timer Dave Adams best described it when he said: "I came, I looked, but it ain't so."

Seventeen square miles of these startling rock formations were set aside by President Coolidge

→ Chiricahua National Monument contains 17 square miles of fantastic towers, spires, needles, and figures carved by erosion in an ancient lava bed overlying the Chiricahua Mountains of southeastern Arizona.

↑ The cliffs of Rhyolite Canyon have been eroded into a maze of stone columns rising from deep, slit-like fissures.

The Standing Stones of Chiricahua

as a national monument in 1924. They are at the northern end of the Chiricahua Mountains which rise like a great wall between San Simon and Sulphur Springs valleys down in the corner where Arizona, New Mexico, and old Mexico meet. Chiricahua is another Apache word meaning "Great Mountain," and if you have trouble pronouncing it, try *cheery'-cow-ah.* Forty miles long, nearly twenty miles wide, and rising to crests almost ten thousand feet high, the Chiricahuas are a rugged wilderness of evergreen forests, wildflower meadows, cascading streams, deep canyons, and lofty ridges. On the map, the little national monument up on the northwestern slope of this sprawling range resembles a postage stamp on a good-sized letter—but it is a collector's item, special issue and very rare.

The area is seventy miles north of Douglas, copper smelting town on the Mexican border, and the same distance south from Willcox. It is easily reached either way by paved, north-south U. S. Highway 666, connecting the two towns, and turning off on black-top Arizona 181 to the monument entrance. The route traverses wide, grassy Sulphur Springs Valley, prime cattle country, where hundreds of white-faced Herefords and humpbacked Brahmans graze ranges big as Eastern counties. This is a fragment of the old pioneer West; the wind blows fresh and clean and the land has an exhilerating sweep of spaciousness under the blue Southwestern sky.

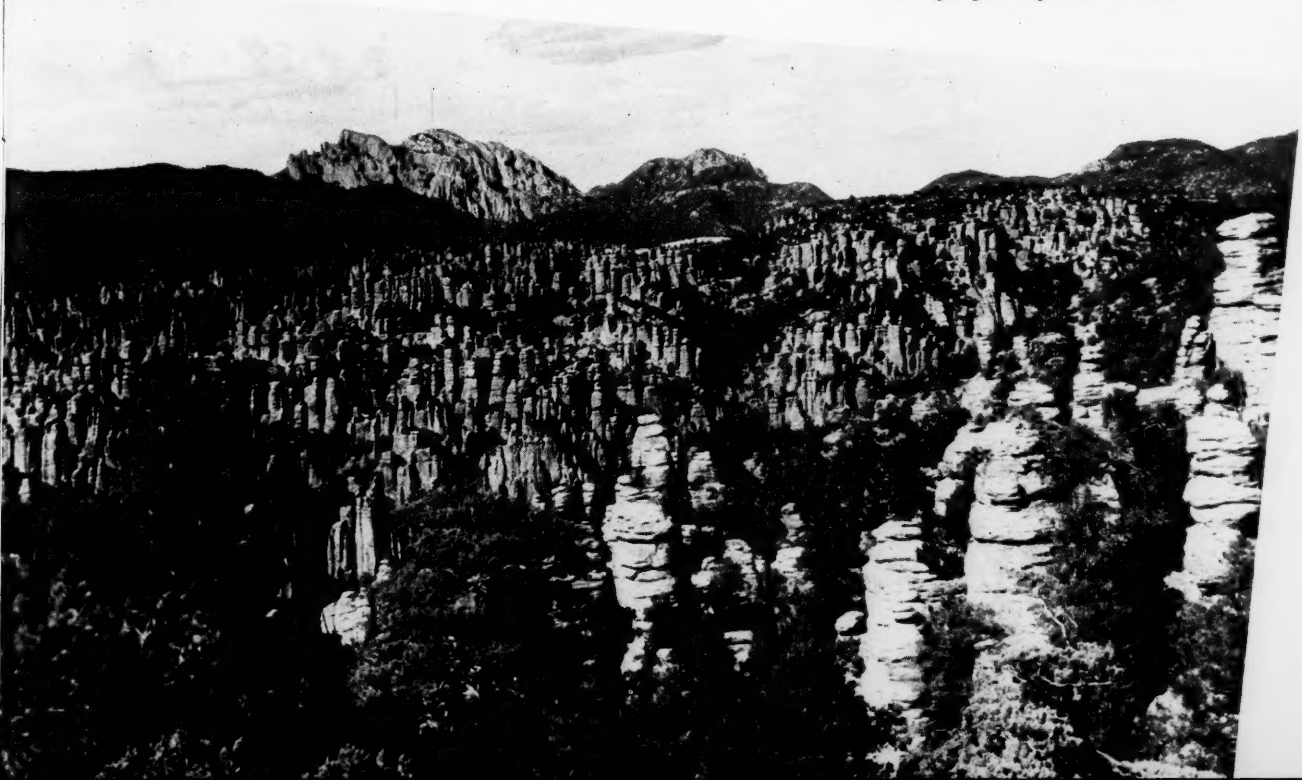
A "Wonderland of Rocks"

The introduction to the Wonderland of Rocks is dramatically sudden. The road leaves the open valley and plunges into a canyon of the Chiricahua Mountains. Abruptly you are transported to another world. Gone are cactus, yucca, and mesquite; in their places are green woodlands of oak, cypress, and pine. And ahead the canyon opens out into a great amphitheater enclosed by high walls bristling with thousands of standing rock pillars and columns.

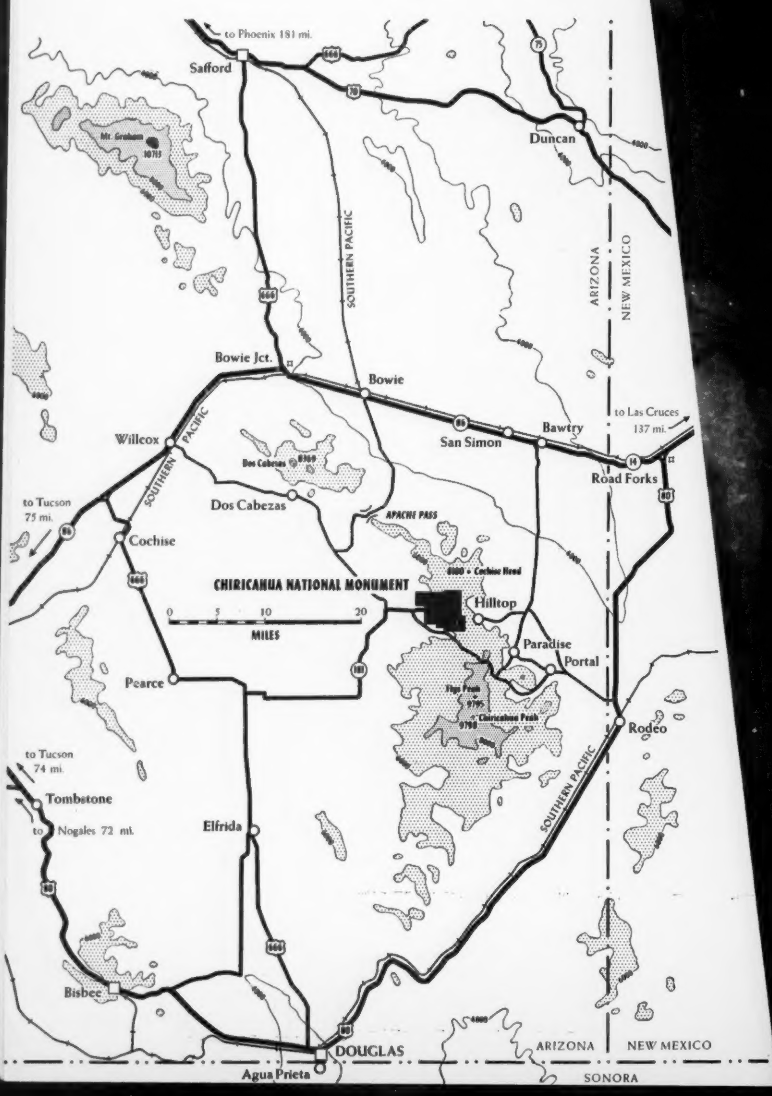
Near the head of the basin, beside Rhyolite Creek, are the monument headquarters nestling in a shady grove of oaks and madroños at an elevation of 5,340 feet. Here all visitors register—there were more than fifteen thousand of them last year from every state in the Union. Free maps and information are available, and you can even procure a folder in Spanish, "El Monumento Nacional de Chiricahua," put out by the good-neighborly National Park Service for Mexican sightseers.

The Administration Building, custodians' and rangers' houses, and all utility structures are built

Photographs by the Author



The Echo Canyon trail traverses some of the finest rock formations.



of native fieldstone and blend unobtrusively with their surroundings. They are a heritage from the pre-war days of the hard working CCC boys, who also constructed the fourteen miles of well-graded trails. As in most of the national parks and monuments, the remarkable public service rendered by the CCC is sorely missed and much of the present development would never have been accomplished without its help.

Clair V. Cooke is custodian of Chiricahua National Monument. I hope you catch him in. He and Mrs. Cooke love the area and can tell you about places to go and things to see that are missed by the average tourist. And be sure to remember us to him. Although we live only a hundred miles away—and so are neighbors—we don't see the Cookes as often as we would like.

Beyond headquarters, the road follows wooded Bonita Canyon between sculptured cliffs rising six hundred to a thousand feet. Weird rocks stand out from the walls and march up the slopes singly and in complicated clusters of grotesque shapes. If your imagination is in fair working order you can discover "China Boy," with his square oriental hat; the mitred "Bishop"; "The Boxing Glove"; "The Praying Padre"; and "Cathedral Rock." For some reason, ducks seem to be a favorite subject in Chiricahua's natural hall of statuary. Bonita Canyon has its "Ugly Duckling"; "Donald Duck" leers down Hunt Canyon; and "The Duck" sits hatching stone eggs at Heart-of-Rocks. Above, the canyon widens, the road passes through open, piney parks, climbs to the lofty, windswept backbone of the Chiricahua Mountains and ends at Massai Point, seven miles from headquarters, at an elevation of 6,850 feet.

Here, the entire monument is spread out before you—a wilderness of gray chimneys, steeples, beehives, giant stone mushrooms, pedestals, and balanced rocks, rising in bewildering profusion from every canyon, slope, and crest. Trees and chaparral thread the defiles and climb between the upstanding rocks, softening the severity of this uncanny landscape; and lichens mottle the naked stone with bright patches of green and yellow. In the distance, nearly three thousand feet below, Sulphur Springs Valley unrolls its carpet of grass to the foot of the jagged Dragoon Mountains on the western skyline. A vast expanse of golden yellow most of the year, the valley becomes green as a well-kept golf course during the rainy season of July and August.

From here too, you have a movie close-up of the mammoth petrified features of Cochise Head, now only four miles to the northeast. This natural stone profile, rising 8,100 feet above sea level, with its domed forehead, jutting nose, and a tall pine tree for an eyelash, is a fitting memorial to a wise and brave red man who once ruled these wild mountains and widespreading valleys.

How it happened

As you stand at Massai Point you wonder how this amazing area came to be. Geologists, who know about such things, tell us that the Chiricahua Mountains are the result of a half billion years of geological changes. The twisted jumble of layers, dikes, and ledges composed of granite, gneiss, schists, limestone, and lavas which make up the range indicate almost every kind of earth-building activity since the misty dawn of the Paleozoic Era. At least once, and probably twice, the region was inundated by the sea.

But the dramatic events which ushered in modern times began in the Tertiary Period, some twelve million years ago. There occurred then a series of violent volcanic eruptions which undoubtedly broke out intermittently for centuries. Over and over again the earth shook, rumbled, and spewed forth smoke, ashes, and ponderous flows of red-hot, molten lava which covered the country layer upon layer to a depth of several hundred feet. Today, you can still find deposits of volcanic ash among the rocks, and by the road near the head of Bonita Canyon are bright red shale beds, laced with white veins of gypsum, once the bottom of an ancient lake formed when upwelling lava dammed a stream. Eventually the fires died and the lava solidified into basalt and rhyolite rock—a level field of it, geologists say, many square miles in extent and sloping slightly toward the west.

So after an epoch and a few milleniums the job of vulcanism was done and the mysterious mountain-building forces called orogeny took over the work. The earth heaved and buckled. Slowly, inch by inch, the great lava field was lifted bodily and tilted by the growing Chiricahua Mountains until it covered the west slope from the crest almost to the base. Under the stresses and strains of its upward journey the rock split into vertical cracks and was shattered into blocks and fragments. Running water from a billion storms enlarged the cracks into fissures, gulleys, and canyons, and with

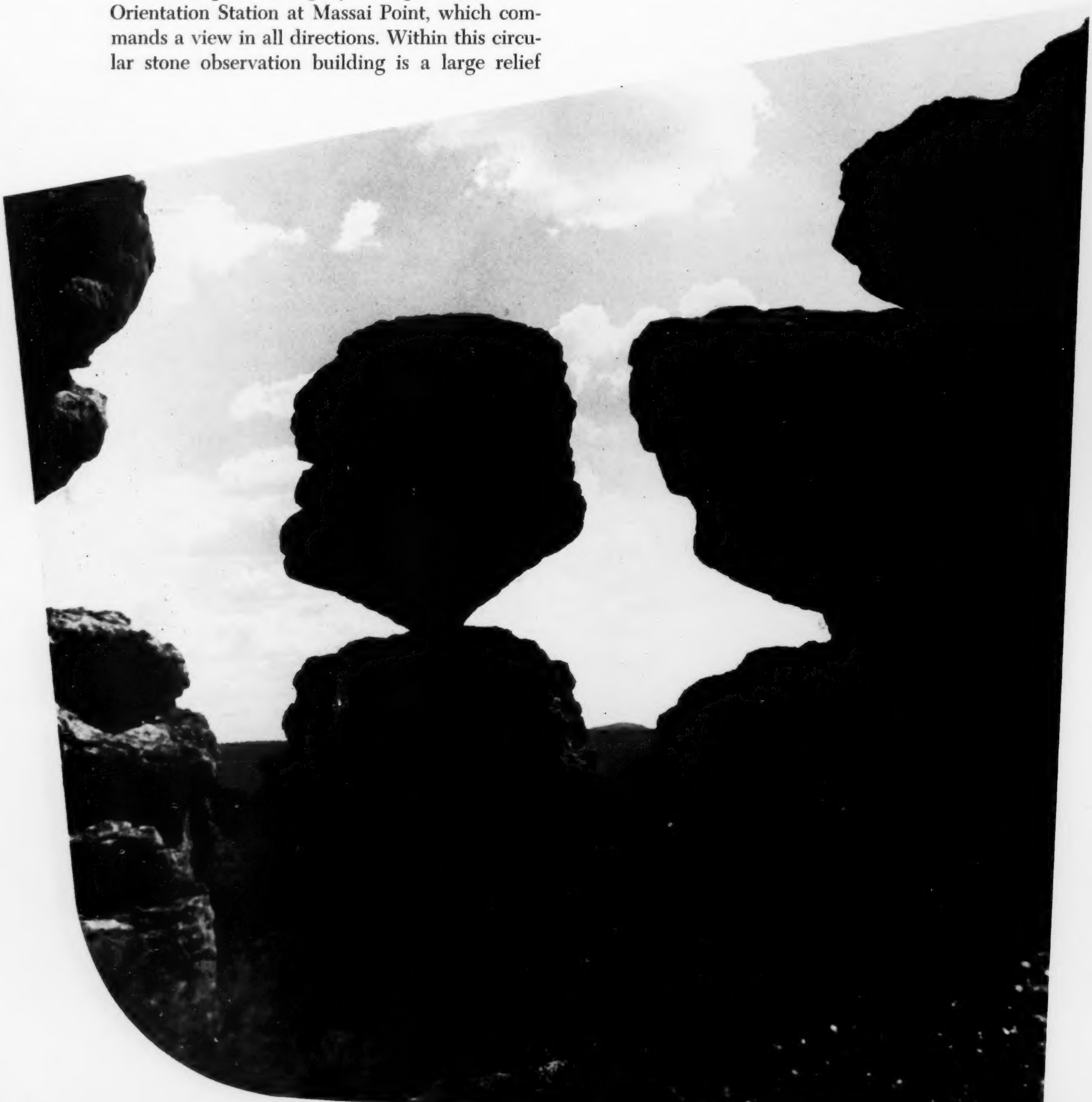
the help of frost, melting snow, and wind has carved the remaining lava blocks into an unbelievable multitude of sizes and shapes.

Erosion still goes on slowly, steadily, persistently. Occasionally the stillness of these canyons is broken by a rock falling or the clatter of a train of pebbles sliding off some high, crumbling ledge. Each rain too, sluices away tons of sand, silt, and debris. The Wonderland of Rocks is only a short act in the continuing earth drama, but it is a good show, well worth seeing.

Exploring

The best place to begin your explorations is the Orientation Station at Massai Point, which commands a view in all directions. Within this circular stone observation building is a large relief model of the monument. Canyons, ridges, streams, roads and trails are shown and distances given. You can plan your hike before you start and roughly estimate the time it will take you — but be sure to allow a little extra for the inevitable uphill pull back to Massai Point.

An eight-mile trip to Heart-of-Rocks and back takes you to the most concentrated and extensive collection of bizarre natural sculpture in the monument. On the way you can see the remarkable 137-foot stone sliver called "The Totem Pole" against the eastern wall of Totem Canyon, and the



sixteen-ton "Big Balanced Rock," perched on a base a few inches in diameter. A short loop trail, giving magnificent views across Rhyolite Canyon, threads the Heart-of-Rocks area. You pass gigantic "Thor's Hammer"; "Punch and Judy" carrying on their violent, centuries-old quarrel; "The Old Maid" whose stony heart has not known love, at least since Pleistocene times; and scores of other petrified male and female dignitaries, beasts, birds, whimseys, and just plain rocks.

More beautiful is the four - and - a - half - mile round trip following Rhyolite and Echo canyons. The latter is a delightful little forested glen between rows of rock towers, with a musical stream tumbling down over ledges and lingering in deep, fern-edged pools. The trail is shaded by cypresses, pines, and oaks, and in the upper canyon climbs up into some of the most spectacular rock formations. The pathway winds and twists along narrow, stone-walled corridors barely wide enough to pass through, and in places the trail builders were forced to blast a passage among slit-like fissures between the soaring rocks. To me, Echo Canyon is the prize exhibit of Chiricahua National Monument. It is a peaceful, unspoiled, complete little world tucked away among the grim wilderness of stone.

Another easy mile-long trail leaves a side road near Massai Point and circles to the fire lookout atop Sugarloaf Mountains, 7,308 feet, highest point in the monument. There, the panorama widens to include a sweep of San Simon Valley on the east, backed by rows of New Mexican mountains; the high, swelling summits of the Chiricahuas to the south; and beyond, lofty, phantom ranges far down in Mexico. There are several

↑ Sheer rock towers and pinnacles rise several hundred feet above Echo Canyon's green, forested glen.
← The "Big Balanced Rock" is a 16-ton boulder perched upon a base inches across.

other unimproved paths which lead to Inspiration Point; south into Jesse James Canyon; and from Bonita Canyon two and a half miles to a small but interesting natural bridge. All of the main trails from Massai Point connect with the Sara Deming and Rhyolite Canyon trails to headquarters, so that through trips and loops may be made from either end.

If you would rather have four legs than two, you can hire horses at Faraway Ranch by the monument entrance. Meals and overnight accommodations are available at the Silver Spur Guest Ranch near headquarters, and the Park Service maintains roomy, improved campgrounds in Bonita Canyon and a small picnic area, with firewood but no water, at Massai Point. Although some snow falls in winter, it melts quickly below 7,000 feet at this latitude and monument roads and trails are open all year.

Zones of life

Of course, the rocks get the lion's share of the publicity, but the fascination of Chiricahua National Monument is not in geology alone. The area is a superb natural botanical garden, zoo, and aviary of surprisingly varied plant, animal, and bird life. Like an isolated, green, wooded island these mountains rise from arid grasslands into a climate comparable to Labrador's, and within the space of a few miles are compressed five of the seven major life zones of western North America. Here, Lower Sonoran cactus is within sight of Hudsonian Engelmann spruce, and between the two, according to one authority, is a greater range of plant life than in any equal-sized area in the country.

At any rate, 507 different species of plants, representing 80 botanical families, have been collected in Chiricahua National Monument. The canyon bottoms and cool north-slopes are densely wooded with oaks and conifers. There are seven species of the former and nine of the latter. Ponderosa and Chihuahua pines, Douglas fir, and Arizona cypress make up the bulk of the forest, while straggling alligator junipers and piñons climb the rocky slopes to the ridges. At Massai Point is an unrivaled collection of dwarf, wind-twisted cypresses, junipers, and piñons which look as if they had been copied from a Japanese print. Warm, south-facing mountain slopes are clothed in green chaparral composed mostly of scrub oak and manzanita, which shades off at lower elevations to open hillsides dotted with a desert vegetation of yuccas, agaves, and cacti. Fourteen varieties of ferns can be found among the canyon rocks, and colorful wildflower displays are in progress at some elevation from early spring to late fall.

Like an island too, the Chiricahuas have their races and even species of plants, animals, and birds unlike those found anywhere else. Thus the indigenous Apache squirrel differs from his closest relatives in nearby mountains, and special Chiricahua species of hummingbirds and butterflies sip nectar from unique varieties of wildflowers.

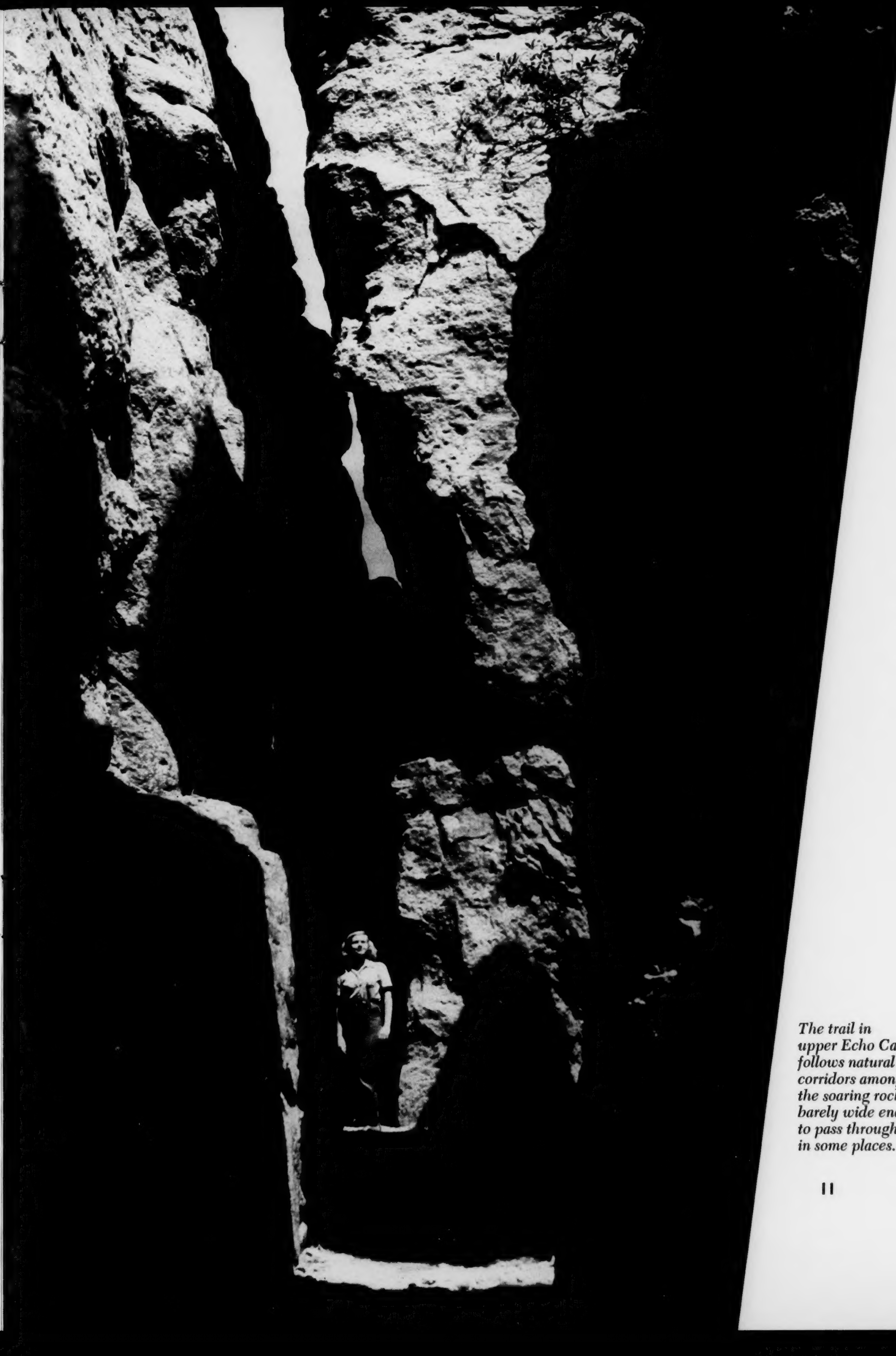
Furthermore, there is an interesting blending of northern forms of flora and fauna with those of Mexico. The mountain lion, bobcat, black bear, and white-tailed deer cross trails with the Mexican mule deer, peccary, or wild pig, and the strange anteater-like coatimundi. Even jaguars, ocelots, thick-billed parrots, and the rare coppery-tailed trogons stray north of the border on occasional visits. The same wide variation and special types prevail among the snake, lizard, and insect population.

So with such a wealth of unusual growing, running, flying, and crawling specimens, the Chiricahuas and the other ranges of southeastern Arizona are happy hunting grounds for naturalists. They come from all parts of the country to search for new species and to try to straighten out the scrambled natural history of the region.

The archeologist and historian can also find much of interest. The country has been inhabited by man for over five thousand years. When white men first came to southeastern Arizona it was occupied by the most ruthless and war-like Indians in North America. One of their impregnable strongholds was the Wonderland of Rocks. For two centuries no Spaniard, Mexican, or American was safe from the marauding, murderous bands of Chiricahua Apaches who swept down out of their mountain fastnesses like devastating tornadoes and as quickly vanished, leaving death and destruction in their path. It was not until Geronimo, the last battling Apache chief, surrendered to the United States Army in 1886 that peace came at last to southeastern Arizona.

Apache stronghold

Greatest of the Chiricahua Apaches was Cochise. Pronounced Co'-chees, today a county, town, and mountain bear his name. Alone among Apache leaders, he was friendly with the Amer-



The trail in upper Echo Canyon follows natural corridors among the soaring rocks barely wide enough to pass through in some places.

icans. But the stupid actions of a young second lieutenant, fresh from West Point, turned Cochise into a relentless, implacable foe. For almost twelve years—from 1861 to 1872—Cochise and his braves shot, burned alive, and tortured hundreds of Americans and destroyed thousands of dollars worth of property. White men were powerless against him, and he died unconquered, one of the world's most brilliant military generals. The story of the Chiricahua Apaches' struggle for their homeland and their great chief's friendship for one American is an epic of the Southwest. It is beautifully told in Elliott Arnold's novel, *Blood Brother,* from which the current motion picture, *Broken Arrow,* has been taken.

After the Apaches were vanquished white men swarmed into the country. But now and again renegade Indians escaped from the San Carlos reservation on the Gila River to their ancestral mountains. One was Big-foot Massai who hid out in the deep canyons of the Wonderland of Rocks. He was a wild and furtive savage who became almost a legend. For five years Massai fought, single-handed, Americans, Mexicans, and tame reservation Indians whom he despised. He made off with squaws, raided ranches, and rustled cattle and horses.

Colonel Jhu Stafford and Sergeant Neil Erickson had taken up homesteads in lower Bonita Canyon about where the entrance to the monument now is. In the fall of 1886 Massai and his squaw of the moment swooped down out of the mountains and stole the colonel's favorite horse. The two ex-soldiers pursued the Indians through the wilderness of Chiricahua's standing stones to the lofty point now named after Massai. The culprits eluded them, but they recovered the horse, and were the first white men to see the Wonderland of Rocks. The huge tracks of Big-foot Massai were last seen in Bonita Canyon in 1890. It is probable that he died in the area and that a suitable natural stone monument rises above his remains.

So these, in bare outline, are some of the things you can see, hear, feel, and savor in Chiricahua National Monument—just one of the infinitesimal spots in the vast slice of emptiness we can see from our porch. Another favorite of mine is Mount Graham humping up like a great blue whale nearly 11,000 feet high on the northern horizon, nearly a hundred miles away. I would like to tell you about that — sometime. END

THREE VOICES OF THE NIGHT

Owls have considerable appeal for the popular imagination, in which, oddly enough, they play two distinctly different roles. On the one hand, they are regarded as birds of mystery, associated with haunted houses, weird nocturnal sounds, and shadowy figures in the dark. "It was the owl that shrieked, the fatal bellman . . . . . I heard the owl scream and the cricket cry" *(Macbeth,* Act 2, Scene 2). In the other phase of their split personalities, owls symbolize wisdom—an association that goes back at least 2,500 years.

The owl was the bird of Pallas Athene, daughter of Zeus and special patroness of the arts and sciences. According to Greek legend, this versatile goddess taught men to tame horses and oxen, invented the plough, introduced the olive tree, and —in more feminine mood—encouraged spinning and weaving, and played the flute. In Roman mythology she became Minerva, the goddess of wisdom; and the owl went right along as part of her entourage, thus maintaining its reputation for intellectual attributes.

Science cannot claim for owls any special wisdom, nor any particular mystery—their haunts and habits are about as well known as those of diurnal birds. But they do present some features of unusual scientific interest. Birds have less accurate temperature control than mammals, and their body temperature will vary several degrees a day. In most birds the temperature is highest in the daytime and goes down at night, but in owls the temperature is highest during the dark hours.

Another fact of interest is that owls have binocular vision. A majority of birds are, to use a common expression, wall-eyed. With eyes set in the sides of the head, they look in two directions at once. A limited few, among them swallows, terns, and hawks, can bring the eyes to focus together when they want to—that is, they can look forward past the tip of the beak and cause both eyes to converge on a single object, be it insect, fish, or mouse. Owls, however, with their eyes set in the front of the head, habitually bring both eyes to focus on the same field of vision, just as you and I do.

It is not true that owls are blind in the daytime. But they have very large pupils for seeing at night; and too much light causes them to be dazzled and

HT

uncomfortable—as we are, for example, when we encounter bright sunshine on snow. An owl could see very well in the daytime if it wore dark glasses! A few species of owls are, in fact, partially adapted to daylight conditions even without sun glasses.

The pygmy owl, the short-eared owl, the hawk owl, and the burrowing owl all are active to some extent in the daytime. It would be a fair guess, however, that their vision at night is not as acute as that of the more strictly nocturnal species.

Owls, in general, can be considered as among man's most valuable bird allies. The food of the smaller species consists principally of crickets, grasshoppers, beetles and other insects, often supplemented with mice. The larger owls feed mainly on rodents, rabbits, and other small animals. On occasion birds are eaten but they constitute a negligible source of food in contrast to the numerous insects and rodents that are active and readily available at night.

The three species of owls illustrated in the striking photographs by Don Bleitz in this issue of *Pacific Discovery* are widely distributed over much of North America.

The barn owl (p. 17) is a widespread species known to the peoples of many lands. As its name implies, it frequently inhabits man-made structures, such as barns, lofts, and church steeples. Where it occurs away from human habitations it frequents holes in hollow trees, banks or cliffs. The common call of the barn owl is a single, drawn-out, rasping screech, frequently heard as the bird is flying. It also utters a series of clicking notes.

The screech owl (p. 16) is one of the commonest small owls over much of North America. In eastern North America the screech owl comes in either of two color phases, a gray or a red. In the West, however, all of these owls are gray. The name is definitely misleading, as the call is far from a screech. It has been compared to the whinnying of a horse, but is much more subdued and mellow—even melodious. This species commonly nests in holes in trees.

The long-eared owl (cover), unlike the two species previously mentioned, does not nest in hollow trees, holes, or other such cavities. In fact it rarely undertakes the complete construction of its own nest but usually appropriates an old hawk or magpie nest. This species frequently shows colonial tendencies, especially in regions where timber is scarce. A number of pairs may nest very close together in a small grove of trees, and in winter as many as fifty individuals have been found congregated together.

The voice of the long-eared owl is quite varied. It has been described as suggesting the barking of a puppy, the mewing of a cat, or as something between the voice of a fox and a cat. Such sounds are made when the owl is excited. Its ordinary call is a low, mellow hoot, much like the note of the band-tailed pigeon.

It is not easy to learn all the calls of all the owls in one's own vicinity. But it is quite easy to become familiar with the characteristic calls of the more common species. And it gives one a peculiar feeling of kinship with nature to be outdoors in the darkness, and to listen with understanding to these voices of the night.

CAMERA NOTES

Long-eared Owl (COVER). *Climbing a live oak near Laguna, California, I made a few shots of a single young owl in the nest about 25 feet above ground, while the parents flew around within a few feet of me, mewing like a tomcat. The photograph was made from a distance of five feet on 4x5 Kodachrome film with an 8″ f.7.7 Kodak Ektar; exposure 1/50 second at f.11 with two No. 2B flash. The print is from a Monochrome on Super Panchro Press "B" developed by inspection.*

Screech Owl (PAGE 16). *Photographed in Los Angeles County, California, from a distance of 2.5 feet on 4x5 Kodachrome Daylite film with an 8″ f.7.7 Kodak Ektar; exposure 1/50 second at f.16 with two No. 2B flash. The print was made from a Monochrome negative on Super Panchro Press "B." The camera was released electrically.*

Barn Owl (PAGE 17). *In Frazier Mountain Park (Kern County, California), one time, I saw this owl perched in the top of a valley oak. Getting out of the car with my camera did not cause her to fly, so I climbed the tree. She still did not fly, so I got several nice shots of her and also some of her four young, which I found in the hollow end of a broken stub. Suspecting a tame bird, I learned later on enquiry that a resident of the neighborhood had found a barn owl with a broken wing and had made a pet of her; I feel sure it was this same bird that had set up housekeeping in the oak stub. The original was taken on Kodachrome Daylite with an 8.5″ lens, exposure 1/50 second at f.8, focal plane synchronized, one fill in flash, one No. 2A flash; Monochrome on Super Panchro "B."*

BY ROBERT CUNNINGHAM MILLER · PHOTOGRAPHS AND NOTES BY DON BLEITZ

American Trust Company

presents

SCIENCE IN ACTI

a television series

THE ATOM TOMORROW

Cameramen, above—left to right: Jim Greene, Pierce Hawk

This TV script has been specially edited for publication in *PD*

SCIENCE IN ACTION
A Television Series
Created and Produced by the California Academy of Sciences
DR. ROBERT C. MILLER, *Director*
Sponsored by the American Trust Company

Program 14
"THE ATOM TOMORROW"
Written by BENJAMIN DRAPER
Station KGO-TV, San Francisco
Thursday, December 21, 1950
7:00-7:30 P.M., PST

Cast

TOM GROODY . . . . . *Host Narrator*
DR. HARVEY E. WHITE . . . . . *Guest Scientist*
(Professor of Physics, University of California)
ROBERT BELL . . . . . . *Assisting Scientist*
JOHN HARVEY . . . . . . *Program Announcer*
ERWIN FOSTER . . . . *Property Boy*
"SHORTY" the short-eared owl . *"Animal of the Week"*

Appearing in Special Film Sequence
DR. GLENN T. SEABORG, *nuclear physicist, University of California*

Staff

RUSSELL BAKER . . . *KGO-TV, Station Director*
BENJAMIN DRAPER . *California Academy of Sciences*
KEN JONES . *McCann-Erickson Advertising Agency*
JOHN R. MACDONNELL . *KGO-TV, Technical Director*
ALDEN S. NYE . *McCann-Erickson Advertising Agency*
TOM WEATHERWAX . . *KGO-TV, Floor Manager*

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California Academy of Sciences

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Balopticon slides
- Cyclotron—Dr. Harvey E. White
- First electric light—Academy Library
- Early telephone—Academy Library
- Early steam engine—Academy Library
- Betatron—Academy Library

Newspaper clipping—Academy Library
Drawing, Atomic Teapot—prepared by Department of Exhibits, California Academy of Sciences
Periodic Table—Department of Physics, University of California
Geiger counters—Department of Physics, University of California
Radioactive tomato plants—University of California
Model of Atomic Pile—made by Professor White
Books on atomic research—Academy Library
Blackboard, chalk, eraser—KGO-TV

ACTION

W

TV SCRIPT BY BENJAMIN DRAPER

Photographs by Elmer Moss

VIDEO

Close-up of model of atomic pile. Hand enters scene and pulls out first one rod then a second. Tight close-up.

Superimpose balopticon slide:
"THE ATOM TOMORROW"

Superimpose title: "SCIENCE IN ACTION"

Superimpose title: "Created by the CALIFORNIA ACADEMY OF SCIENCES."

Superimpose title: "Presented by the AMERICAN TRUST COMPANY."

Dissolve to Tom Groody seated at his desk

Series of pictures on easel. Hand turns them as Groody narrates:
"Steam engine"
"Telephone"
"Radio and television"

Dissolve to Groody

Camera pans to Professor White who is seated at desk next to Groody

AUDIO

MUSIC. *American Trust Company theme (Holst, "The Planets"). Establish and hold through close-up of pile. Fade to Announcer.*

ANNOUNCER. The atom tomorrow! You have just seen an atomic pile, an energy-producing machine that works to bring better, finer things to all of us.

"Science in Action" brings you a second chapter in the story of man's discovery of atomic energy, a discovery that is the greatest accomplishment in the history of science.

These "Science in Action" programs are produced by the California Academy of Sciences, founded in 1853, the oldest scientific institution in the West.

This series of programs is presented to you as a public service by the American Trust Company, itself with nearly a century of service, founded just a year later, in 1854.

(Crescendo music. Hold for a moment then fade to Groody.)

GROODY. Good evening. Last week we brought you on "Science in Action" the story of splitting the atom, man's learning to derive energy from breaking down the tiniest particle, the atom.

Most of you have probably thought that the only use to which atomic energy has been put is the building of the atomic bomb. This is not true. There are many other uses for atomic energy, uses that are realities today.

Tomorrow, when research has discovered still more things about atomic energy, there will be even greater uses for it, more benefits for you and me.

The discovery of atomic energy is a discovery that can help mankind to a better life, in more ways than the steam engine, electricity, the telephone, and even radio and television. Atomic energy, when put to good uses, is greater than any of these.

We have again invited Professor Harvey E. White of the University of California to be our guest scientist. Professor White is going to tell us of the good things that atomic energy can do.

Welcome once again to "Science in Action," Professor Harvey E. White.

PROFESSOR WHITE: Thank you, Tom. I'm very glad to be with you again. Last week was a most interesting experience for me. It was my first appearance on television.

GROODY: That makes you a veteran! We're going to start tonight with a new word—"fission." Professor White, can you explain to us what fission is?

PROFESSOR WHITE: The story of fission is a very important one. I'm going to tell you about the five points you see written on the board here.

Tom Groody, right, greets Professor White, University of California physicist

Tight close-up of White
Tight close-up of the word "FISSION" which is printed on blackboard

Dissolve to White who is standing at blackboard

Tight close-up of words that are written on the blackboard:

1. Becquerel
2. No. 92, Uranium
3. Hahn and Strassman
4. Einstein
5. Bohr

Albert Einstein was a young man when he published his Theory of Relativity

Camera follows White's hand as he draws and illustrates on the board
Relief shots of White's face, dolly back occasionally

Dissolve to Groody

You remember last week we saw how radioactivity was discovered when the French scientist, Henri Becquerel, found that some photographic films in the drawer of his desk had been affected by rays from a piece of pitchblende or radium ore that was lying on the top of the desk and how the rays made an image of a key on the unexposed film. That started the age of atomic energy.

Many scientists in all parts of the world began to study radium and uranium, to see if still further elements could be discovered. In trying to break down the last known element, uranium, number 92 in the Periodic Chart, Hahn and Strassman discovered that uranium behaved differently from other elements. They discovered it could be split in two and that simpler elements resulted from the split.

Without boring you with a lot of complicated detail here, let me just say that physicists everywhere saw at once the importance of this discovery. It meant that the equation Albert Einstein had stated in his first paper on the Theory of Relativity, in 1905, could be realized.

Professor Einstein had stated very simply that $E = mc^2$ or that energy was equal to the amount of mass multiplied by the velocity of light, squared. When you realize that the velocity of light is 186,000 miles a second, you can see what a great amount of energy is released from any very small amount of mass. Scientists knew that when fission, or the ability of the uranium atom to split and release energy, had been discovered, man could produce an explosion that was almost beyond comprehension.

Niels Bohr, the great Danish Nobel prize winner, brought the news of this discovery to the United States.

GROODY: That was a rapid explanation of a most important process, Professor White. Let's see if I can sum it up.

Tight close-up of Groody as he defines fission

Fission, most simply stated, is the breaking down of the uranium atom into two simpler elements, an actual splitting of the uranium atom into two parts with the liberation of a great amount of energy at the same time.

Dolly back to take in White who has returned to desk

Professor White, last week someone asked me why it is that uranium is the element that is used to produce atomic energy, why not some of the other elements?

Dissolve to Periodic Chart

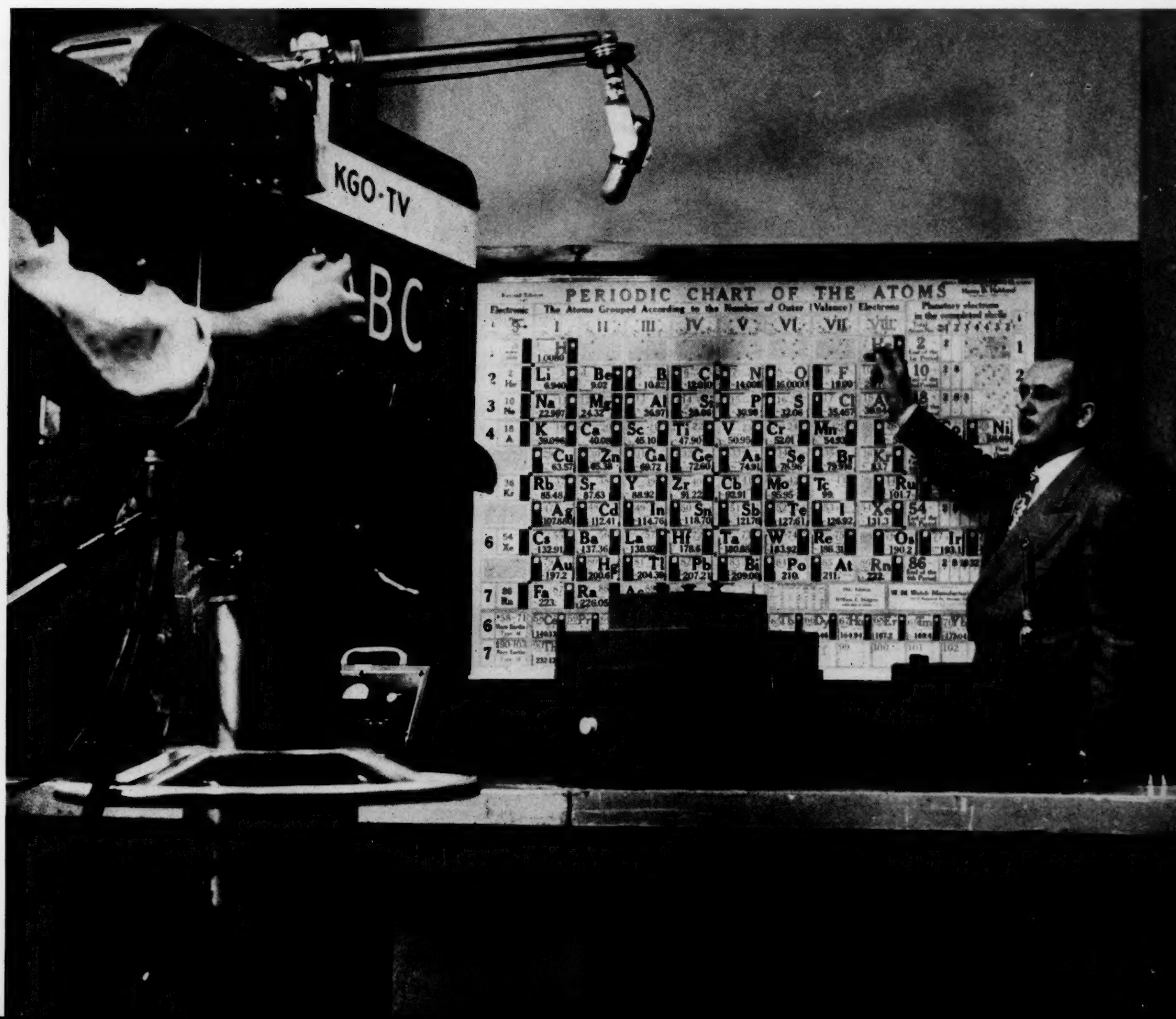
WHITE: That is an excellent question, Tom. Let's look here at the periodic chart, a list of all the elements.

Pan to lower part of chart

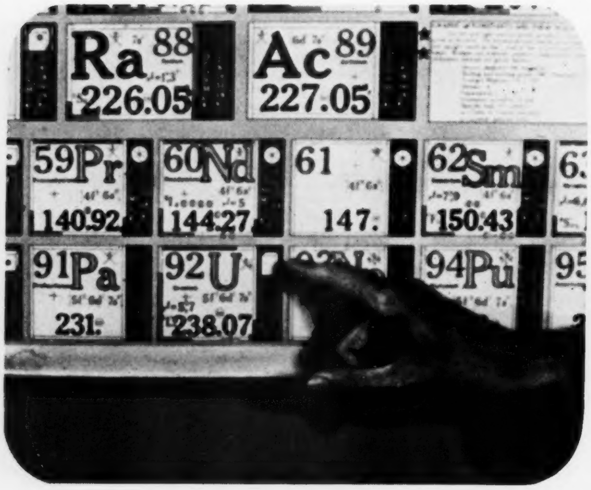
Down at the lower portion is uranium, number 92. It is one of the heaviest elements we know of. We use it to make atomic energy because it has this very ability to split in two and release energy, a characteristic that other, lighter elements do not have.

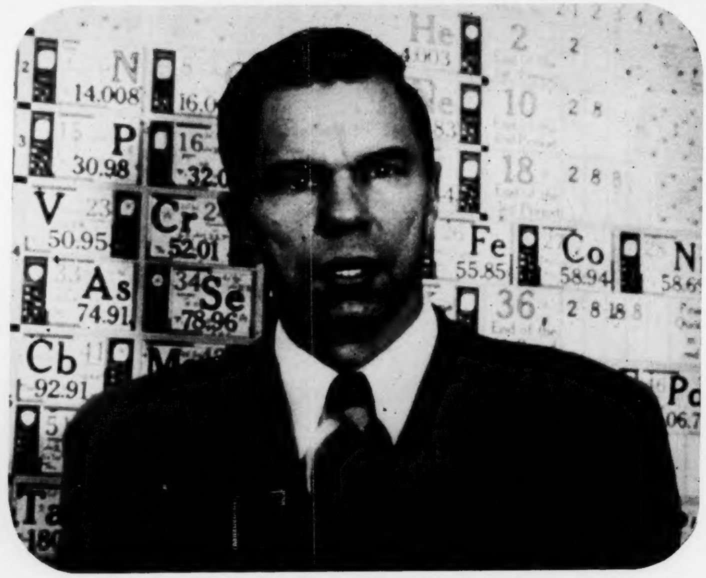
Dissolve to Groody

GROODY: While we are talking about the atomic chart, we are going to take you to Berkeley, to the Radiation Laboratory of the University of California where you will meet Dr. Glenn T. Seaborg, one of the scientists at work there.



Film strip of Seaborg is seen on screen





Dr. Seaborg is explaining the atomic chart we have just looked at. It is a list of all the elements that man has discovered.

He is indicating how they are arranged by groups, across the table and up and down. Elements are listed together with other elements that behave in the same manner, or as scientists say, "that have the same properties."

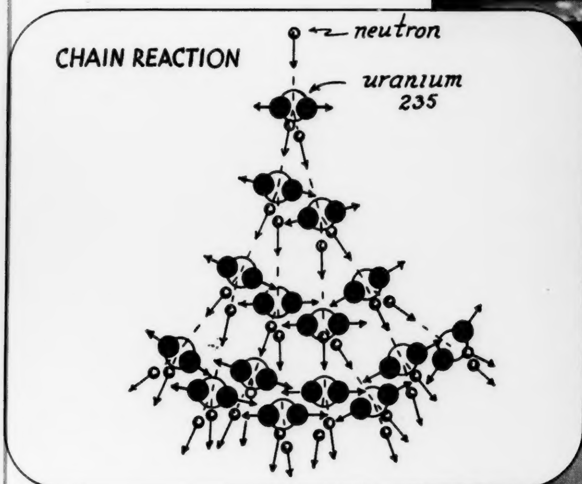
At the lower part of the atomic chart are listed the heavier elements. Here is uranium, number 92. This was the last known element in 1939 when atomic research was begun in earnest. It was here that Hahn and Strassman began their intensive research.

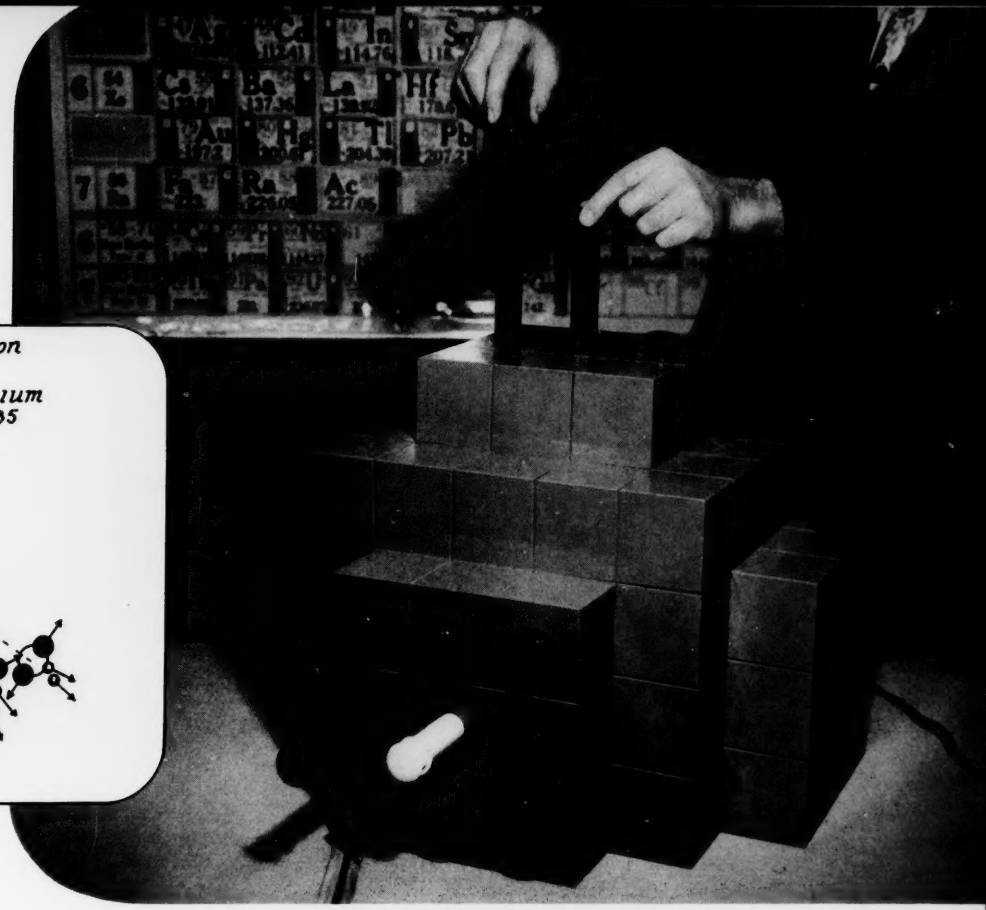
Several new elements have been discovered since 1939, including plutonium, an element that Dr. Seaborg and his fellow workers discovered while they were doing research at the cyclotron in Berkeley. We'll hear more about plutonium in a few minutes.

The last two elements that Dr. Seaborg is pointing to are berkelium and californium, discovered just last

Film strip continues as Groody narrates

▲ Tom Weatherwax, KGO-TV floor manager, coordinates the complex of simultaneous operations that produce a telecast





year and named for the place where they were discovered.

Dissolve to Groody and White at desk

WHITE: This brief glimpse of the periodic chart, or atomic table as it is sometimes called, is helpful. It is very important for us to realize that the orderly arrangement of elements is the key to chemistry. We study each element and the way it behaves in relation to all other elements.

CU of Groody as White moves to laboratory table

GROODY: Our next step is to explain the "atomic pile." I see that Professor White has made a model for us.

Dissolve to model of atomic pile

WHITE: This very simple mechanical model will serve to show you how an atomic pile, or an atomic energy-producing machine, works.

Relief shots as Professor White explains. CU of pile, rods, and blackboard as he illustrates some points

Stated in the very simplest terms, the atomic pile is a pile of blocks in which uranium atoms are at work splitting in two. Embedded in each block of the pile is a small bit of uranium.

"Chain reaction," another new term for us tonight, means, most simply stated, that when a uranium atom splits in two, those two halves in turn split and there are four. These divide and there are eight, sixteen, then thirty-two and so on.

Now to control these chain reactions, there are rods inserted into the pile, rods made of an element called cadmium, an element which slows down the uranium

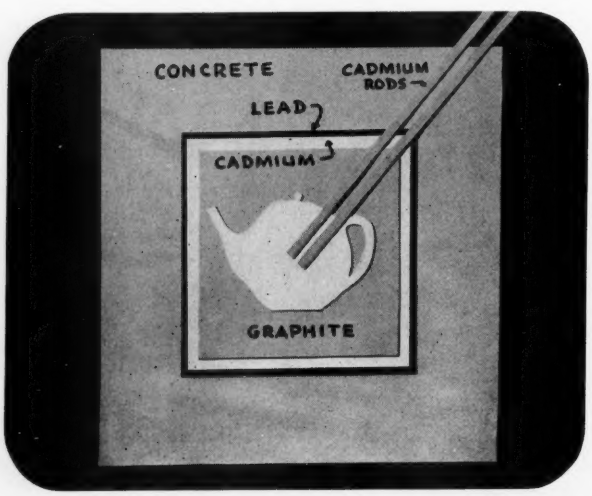
Robert Bell of the University of California Physics Department demonstrates a fact of atomic research: most of it is unglamorous, plodding work with tables and slide rule

CU of Groody's hand holding newspaper clipping

Dissolve to White

Dissolve to first drawing of teapot

Dissolve to second drawing of teapot showing layers



Dissolve to Groody

atoms' splitting by absorbing some of those particles and keeping them from splitting. You realize that this is a very much oversimplified explanation of what goes on but you can see the principle. As I pull out these rods from the pile, the process is stepped up. As I push them in, they absorb particles and the process is slowed down.

GROODY: The atomic pile we have just seen is in reality a power house, just like a light plant in your own town. The pile, instead of producing electricity, produces atomic energy, or heat, that can be used for many purposes as we shall see. It can be used to run engines that make steam or that make electricity.

(Picking up newspaper clipping) I was interested, Professor White, in this newspaper story last Sunday about an atomic teapot!

WHITE: Yes, Tom, that teapot which was described has been bubbling for five years now on the original supply of uranium. It boils water in a matter of seconds.

Of course it isn't really a teapot, but we have put a spout and a handle on it just for fun in this drawing. This will serve to show you how it works.

Here is the teapot filled with water and the cadmium rods in it. There is a tiny bit of uranium in the water which is splitting. Fission is going on, as we have learned. When the rods are inserted, they slow down the fission process. When they are pulled out, it is speeded up and the water boils.

In actuality, it isn't possible to be as simple as it looks in this picture. Here we have the teapot as it has to be, surrounded by several heavy layers of protective covering.

The actual teapot is about the size of a basketball. It needs fifteen feet of protection. Here is a four-foot layer of graphite, a thin layer of cadmium, another of lead, and a final layer of five feet of concrete. So you see a teapot that is run with atomic energy is far from being a reality. The research going on, however, is solving many of the problems.

GROODY: There is research going on like this in many laboratories today, not only by the government but by many large industrial firms.

What are the prospects for using atomic energy?

We know that atomic energy can be used to produce steam and that steam will run trains and ships. Steam will produce electricity. Atomic energy can be used to operate street cars, light plants, to propel ships and submarines, and to make trains run. The fifteen-foot square that encloses the teapot is too bulky for such a gadget but it is not too large, for example, to put on a ship as its source of power. Atomic energy can do for man any job that requires power.

Pan to pile of books on atomic energy

Dissolve to White

Dissolve to Geiger counter, pan to dials and tube

Dissolve to atomic pile

Close-up of tomato plants

Tight close-up of plant as counter is held to leaf

What are the obstacles?

Scientists must first discover a more compact way to handle uranium. There are still problems of making it safe for those who handle an atomic pile. American technical ability, the greatest in the world, will one day find solutions to all these problems.

WHITE: Many other fields of science are served by the new discoveries of atomic energy—both in botanical and medical science much progress has been made.

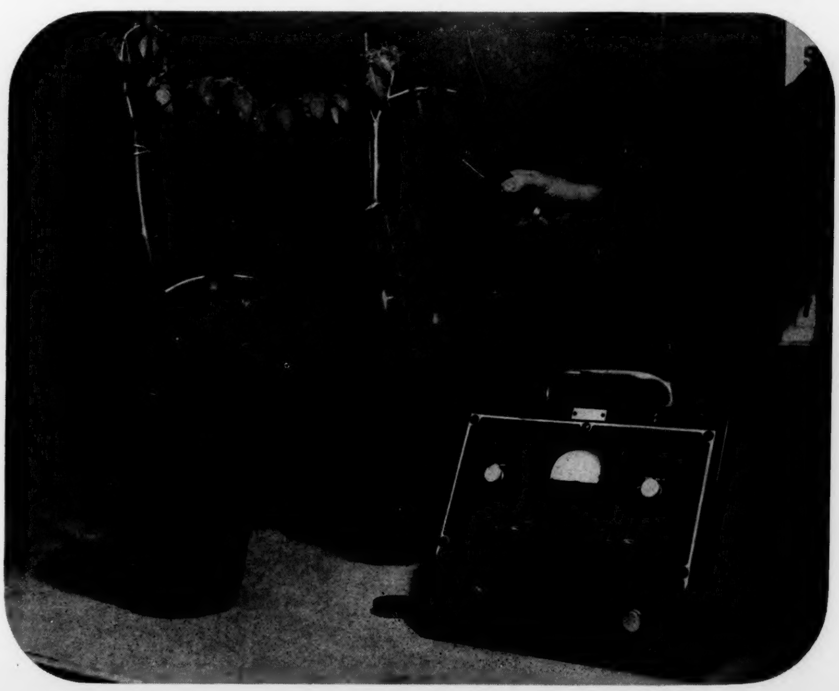
Here again we have two more new words. The first one is "radioactive." Radioactive materials, most simply explained, are those that give off rays, like the piece of pitchblende which caused light exposure on Monsieur Becquerel's box of film. The ability to become radioactive can be acquired by substances that come in contact with other strong radioactive substances, like uranium.

We are going to look at a "Geiger counter," a device that detects the presence of radioactive rays in any substance.

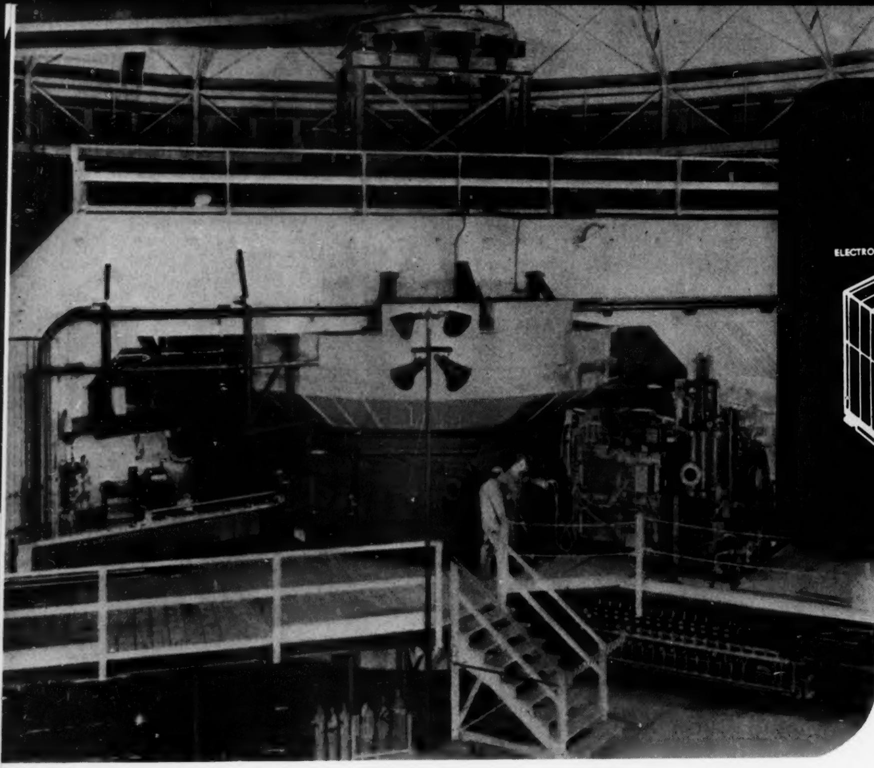
(Demonstrates the Geiger counter with a piece of uranium ore. Holds thick piece of lead between the ore and the counter to show how the rays are absorbed by the lead, providing a barrier. Loud ticking sound is heard.)

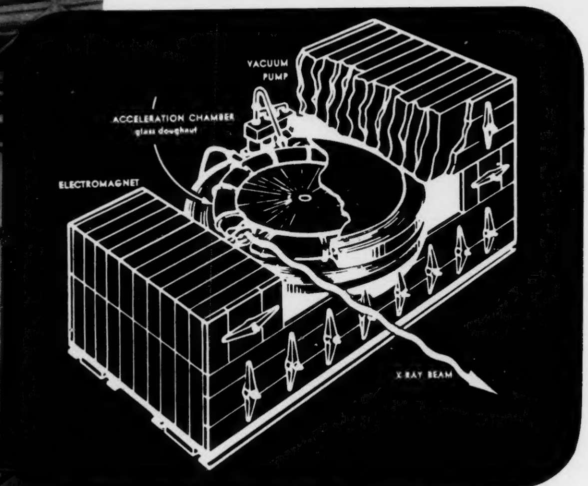
Now scientists can produce many different kinds of radioactive substances by putting them into the atomic pile where they absorb some of the rays that are constantly being given off. In one of these rods is placed any substance which a scientist wants to be made radioactive. In this next experiment, the scientist used phosphorus that had been made radioactive in an atomic pile. Our second word is "tracer."

In order to study a particular botany problem, a tomato plant was watered with a solution that contained radioactive phosphorus. Now by putting the



Has the Geiger counter become a symbol of the Atomic Age? It has, at any rate, become an important tool for research in medicine, plant physiology, and many other sciences





Geiger counter up to the tomato plant, you can detect how far the phosphorus has traveled up into the plant. Hear the loud ticks as the counter is placed at the tip of the leaves. You can see in this way that a thorough study of the plant foods, and other problems, can be made with the aid of this "tracer."

Balopticon slide of cyclotron

GROODY: If you recall last week we looked at the cyclotron in Berkeley and saw a model of the still larger bevatron.

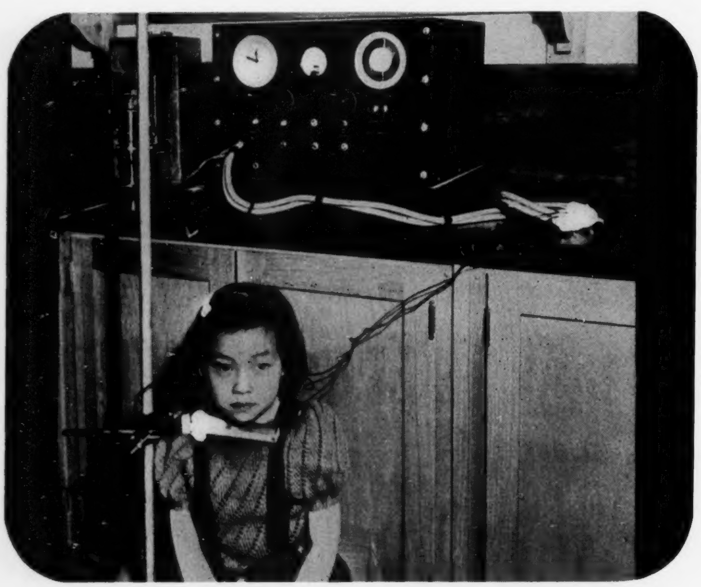
Balopticon slide of betatron

Here is a third kind of instrument, a betatron which medical science is using. The betatron produces rays that are very similar to X-rays and are even more efficient in certain kinds of medical work.

Dissolve to White who is at desk

WHITE: The tracer technique which we demonstrated on the tomato plant can also be used on people.

Balopticon slide of child and Geiger counter



Here we see a little girl who is having a test made of her thyroid gland. She has been fed a substance that travels to the thyroid—radioactive iodine. The doctor can tell from looking at the dials on the Geiger counter how her thyroid is affected and thus have a better understanding of her difficulty.

These substances used in the tracer techniques are by-products of the atomic pile. They are additional benefits to man that come from the main purpose of the pile, to produce energy.

Dissolve to Groody and White at desk

GROODY: Our time is gone already and we haven't covered half of the interesting new things about

➔ "Science in Action" is carefully rehearsed the afternoon before the telecast. Left to right: Dr. Harvey E. White, guest scientist; Professor Albert Einstein, represented by his famous formula; KGO-TV station director Russell Baker; Academy staff writer Ben Draper; host narrator Tom Groody; KGO-TV technical director John R. MacDonnell

← **Diagram of the betatron**

Tight CU of Groody

atomic energy. Thank you, Professor White, for being with us again tonight.

Now a word from John Harvey.

Dissolve to John Harvey

ANNOUNCER: Good evening.

Friends, this is the time of year traditionally dedicated to a spirit of brotherhood and friendship; it is the time of year when families get together to share with one another the true spirit of Christmas.

Series of relief shots of Harvey during Sponsor's Message

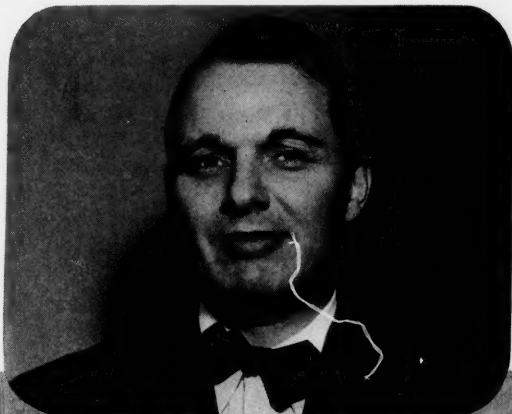
We at the American Trust Company would like to feel that, through our many visits with you on television, we have become, in a small way, *part* of your family group.

And so tonight, speaking for "Science in Action" and American Trust Company, let me express to each of you our sincerest holiday greetings.

We hope that for your family this will be the happiest Christmas ever.

Thank you.

GROODY: Meet the Animal of the Week—Shorty, the short-eared owl.



Dissolve to owl seated on perch. Both cameras follow owl as Erwin Foster ruffles feathers, puts owl on arm and demonstrates

Fade to black

Shorty was brought to my office from the Oakland Public Museum by Erwin Foster, a Student Member of the Academy. The reason Shorty now has his residence at the museum instead of around some swampy area is that he had an argument with an automobile and came out second best. He was brought to the museum with a broken wing. The veterinarian set his wing and he has now completely recovered but he can't fly. He looks big-eyed and sleepy, but since it is night he is really wide awake and ready to go hunting for mice and other mammals.

It is untrue that owls can't see by day, for they often bask in the sunshine and are as able to see as other birds—it's just that they do their hunting at night and sleeping during the day. But even at night they probably hunt mostly by ear, for they have well developed ears.

Shorty looks as though he had no neck but of course he has; it is well covered with feathers. He is called short-eared owl because of the two short tufts of feathers in the region of his ear openings. Notice how fluffy Shorty's feathers are. This fluffiness muffles the sound so that in flight the animals he feeds upon can't hear him coming.

Owls are truly good friends of man, for they destroy thousands of rats, mice, and other rodents that feed on man's food supply. Only occasionally do they kill other birds. Strangely enough, owls are more closely related to hummingbirds than they are to hawks, which they resemble more in their feeding habits. If Shorty were out hunting tonight we might hear him utter his sneezy hunting call—kee-yow!—sounding like an injured cat. Thank you, Erwin, for bringing Shorty to visit us tonight.

GROODY: Tommy the kitten is here next to the skull of a lion, not as an extra Animal of the Week, but as a sort of Animal of Next Week, for he is introducing next week's program. We are going to visit with the animals with silent feet—the cats, from the saber-toothed tiger down to the domestic cat, including lions, tigers, leopards, and other interesting members of this family.

ANNOUNCER: You have just seen another of our television series, "Science in Action"—designed to bring the wonders of science to you in an entertaining and informative manner.

These programs are created through the coöperation of the staff of the California Academy of Sciences under the supervision of Dr. Robert C. Miller, director of the Academy. Tom Groody, research scientist of the Academy, was host and narrator.

Be sure to tune to Channel 7—KGO-TV—every Thursday at this time for another "Science in Action" program—presented by the American Trust Company as a contribution to the many communities served by its banking offices.

DONALD EDWARD McHENRY

Classroom on the Mountain-tops

—THE YOSEMITE FIELD SCHOOL

THE MOUNTAINEER WATCHED with some curiosity the upward progress of a group of about twenty-five persons, mere dots on the side of the mountain far below. There was something about this group which suggested they had more than usual interest in the things which they were passing. In due time they reached the top, individually seeking the most sheltered places from which to view the surrounding panorama. It was then the mountaineer learned that this was the Yosemite Field School making an excursion to the top of Mount Dana as part of their training in interpreting the out-of-doors.

The Yosemite Field School, formerly known as the Yosemite School of Field Natural History, is the oldest school of its kind in the country. It was started in 1925 by Dr. Harold C. Bryant, an official of the California Fish and Game Commission, then pioneering in nature guiding in Yosemite National Park. The school admitted twenty students with majors in natural sciences from colleges and universities from all over the United States. During these early years most of its attention was given to the study of the subject matter of natural history as found in Yosemite. Limited research projects were undertaken on local research preserves within the park on which reports were written and filed in the Yosemite Museum Library. After Dr. Bryant became Assistant Director of the National Park Service and Park Naturalist C. P. Russell moved to other responsibilities in the Service, C. A. ("Bert") Harwell, a graduate of the School, became Park Naturalist and Director. In the School work he was ably assisted by Mr. Joseph S. Dixon, who, as Field Biologist, was an authority on wildlife in the national parks.

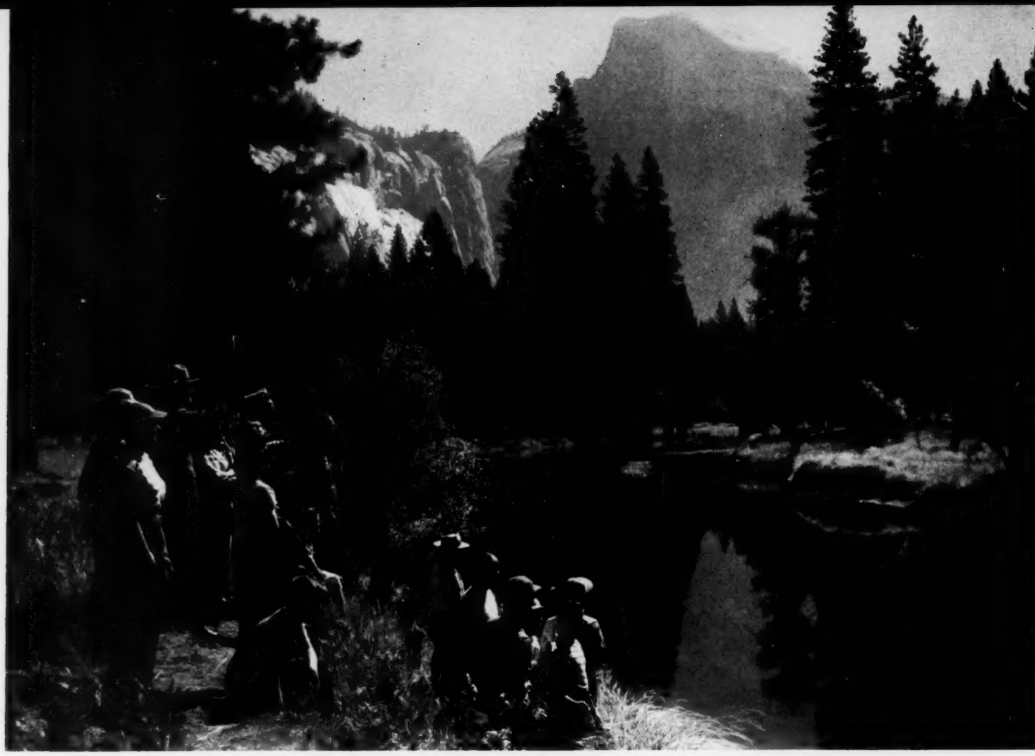
Sessions of the Field School, like many other programs, were interrupted by World War II. Following the pioneering of the Yosemite School of Field Natural History, however, institutions of higher learning, as well as outside conservation organizations, in ever increasing numbers, began experimenting with similar programs in field training in natural history. By the beginning of World War II, a number of these organizations were offering quite comprehensive though brief field natural history programs to school teachers, conservationists, and persons who were interested in becoming more familiar with the things of the out-of-doors.

When the Yosemite School of Field Natural History reopened in 1948, it was evident that to continue a program offering mainly training in field natural history would not only be duplicating the efforts of other institutions, many with greater resources for such work than were available at Yosemite National Park, but also would be ignoring a challenge for more specific training in nature interpretation. In order to meet this challenge, the school shifted its primary interest from pure natural history to specialized training and practice in interpreting the data of science and human history. In order to emphasize this new approach, the name of the school was changed to Yosemite Field School.

Some time after February 28 of the present year, twenty college graduate students with degrees ranging from bachelor's to doctor's, will be selected as prospective students. With the opening of the 1951 session on June 24, these men and women will be offered intensive and varied training in the presentation of natural and human history to the general public. They will be given practice in the techniques of interpretation—on nature walks, to groups of children, before campfire audiences and on museum lectures. They will take up such related matters as museum methods and administration, and the use and preservation of museum and library materials. They will consider the organization and functions of different departments within the National Park Service, their problems and interrelationships.

Realizing that naturalist work can not be rigidly delimited, we employ various approaches in reaching the objectives of the school. The Yosemite Field School is first and foremost a workshop of interpretation; it is a program of participation. Students are housed in the same camp area used by the regular seasonal ranger-naturalists. This keeps them in continual contact with those who are professionally employed, with opportunity to observe how they do their work, and gives them a chance to gain informally much information from them. The "Field Schoolers" also conduct their own practice campfire programs at this camp where they give each other and a few invited friends illustrated talks, using a microphone connected to a tape recorder. Later their talk is audited and criticism offered by a specialist in public speaking.

These practice campfire programs lead naturally to further experience at public campfire programs regularly scheduled as part of the general naturalist activity of the park. Two types of public campfire programs are offered. One is the program held nightly in Yosemite Valley which is usually attended by audiences of around 1,200 people and involves the use of complicated projection and sound equipment. The other type is that which is characteristic of outpost stations where audiences of only several hundred gather, and where the naturalist has to depend on his own resources without aid of any equipment. The



Field Schoolers take a demonstration nature walk. (Anderson photo, NPS)

Field Schooler is trained to conduct both types of campfire program.

The camera stroll is another training experience. This is not so much a matter of learning photography as a procedure to help visitors recognize a picture in the scene in which they find themselves. This type of program had its inception when park naturalists became aware of how much the amateur visitor "missed the boat" when shooting pictures on a vacation trip. Camera strolls then became a matter of directing attention to what makes a picture and how to capture it with even the most inexpensive equipment. In helping to select a picture, the naturalist is interpreting the natural scene.

The Yosemite Junior Nature School is a practice school which the Field Schoolers plan and conduct, operating in teams. Under the guidance of Mrs. Mary V. Hood, volunteer specialist in this field at the Los Angeles County Museum, up to 50 children from eight to fifteen years old spend weekdays participating in field trips, nature craft, and other similar nature activities. Evaluation of the children's work through quiz cards and general accomplishments earns them credits towards "graduation." This ceremony is held as an event at one of the large public campfire programs under the auspices of the Field Schoolers.

Conducted nature walks have become an accepted part of nature programs. The enthusiasm of the leader for the subject matter, although invaluable, is not, however, always a guarantee for success. The manner in which the group is organized, the type of preliminary directions given, the speed at which the group walks or the length of time they remain standing in one spot, the use of one's voice, the level of intellectual approach used for miscellaneous groups, some numbering almost 200—these are a few of the factors which make for success. These the Field Schooler learns by actually conducting walks.

Not every place where a Field School graduate may work will be fortunate enough to have a museum, but in case he should have this responsibility, his training in the Yosemite Field School includes at least the basis of museology. The organization of a park museum set-up, of museum exhibits, study collections and general administrative procedures are studied. The cataloguing of visual and auditory aids, the mounting and filing of slides, operation of cameras, projection equipment, and related instruments is part of the schooling. Proper procedure in selecting and arranging these materials to illustrate talks is stressed.

A very important part of a Field Schooler's museum experience is the understanding of the organization and proper use of the museum reference library. A

Field School students lead a quiz session of the Yosemite Junior Nature School. (Nelson photo)

professional librarian discusses accepted methods of caring for either small or large collections of library materials, so that when one is confronted with the necessity of arranging a collection of books and separates for maximum reference use he will be on speaking terms, at least, with recognized library techniques. An attempt is also made to bring the student up to date on the latest developments in this field. A microfilm system, as well as the newer Microcards, are available for examination. Filing of tape recordings of interviews with pioneers of the region, on which are recorded pertinent historical data, is a part of the training.

Esthetics are also included in the school curriculum. Recognizing that most people go to the parks or other outdoor areas mainly because they are beautiful places in which to vacation, the naturalist staff in Yosemite National Park is experimenting with a technique in emotional and esthetic interpretation. The form which this assumes, at present, is the playing of recordings of good music during the twilight part of the campfire program. The hope is that the emotional and esthetic experiences visitors have under such circumstances will become so closely associated with these moments that when the music is again heard, these experiences will be recalled. This requires that the Field Schooler know something about such music and the most effective medium for its reproduction under outdoor conditions.

Since the Yosemite Field School aims not only to prepare students as nature interpreters but also is concerned in indoctrinating "ambassadors" for conservation, the curriculum includes areas of subject matter not strictly within the naturalist field. For example, Field Schoolers are introduced to some of the protective work usually performed by rangers. They are shown the various methods of fighting forest fire and actually participate in such work under the guidance of specialists in this field. Experts in mountaineering, rock climbing, rescue work, and camping make their contribution to the training course. The park forester points out some of the significant forestry problems peculiar to the protection of forested areas in our national parks.

Though the National Park Service sponsors the Yosemite Field School and later, when vacancies occur, may employ some of its graduates, the intent is not solely to recruit naturalists for the service. Instead, it is to give interested and qualified persons a practical concept of the national park idea—the conservation idea—so that they can apply it to any kind of naturalist work, including school curricula, outside the National Park System.

More than one hundred Field School graduates have been employed by the National Park Service as naturalists, rangers, ranger-naturalists, wildlife technicians, or museum curators. Others are working in state, county, and municipal park systems. Still others have found the course of great value in their work as science teachers, instructors in Audubon Nature Camps, lecturers, writers, science librarians, natural history museum secretaries, and nature counselors in summer camps and scouting.

Living their lives so close to one another and working in a common cause, it is little wonder that Field Schoolers develop a unique esprit de corps. It is understandable that when the day comes for breaking up and going their several ways, there is more than a hint of sadness. The esprit de corps, however, continues through the years in the growing number of alumni scattered over the country. Some, where they are sufficient in numbers, are well organized and holding regular meetings, recalling past experiences and lending support to each succeeding Field School class. An annual *Alumni News Letter* binds them together in a fellowship which becomes more nostalgic as the years roll by.

Doctors Waldo (dark glasses) and Sharsmith (Waldo's left) discuss geological interpretation with Field Schoolers on top of 13,000-foot Mt. Dana. (Hunt photo)

This is what the lone mountaineer learned about these people as they sat clustered around their instructors atop the 13,000-foot crown of Mount Dana in Yosemite National Park—these people whom he saw slowly climbing up the mountain's rocky slope, stopping every now and then to examine some interesting object or to discuss the general scene spread out below. Little wonder that the mountaineer eventually became a Field Schooler himself to join the ranks of those who interpret the natural scene to his fellow man.

END

BUTTERFLIES OF GRAND CANYON NATIONAL PARK. By John S. Garth. *Bulletin No. 11,* Grand Canyon Natural History Association, Grand Canyon, Arizona. September 1950. 52 pp., illus., map. Paper, 75c.

The Grand Canyon Natural History Association has published a series of bulletins on the mammals, amphibians, reptiles, plants, and trees of the park. John S. Garth's *Butterflies of Grand Canyon National Park,* recent addition to the series, lists one hundred and three species, giving the scientific and popular names as well as the food plants. Identifications have been made from specimens recently collected, and submitted to such specialists as Mr. J. F. Gates Clark, Mr. W. D. Field, and Dr. Carl Heinrich of the U. S. National Museum, and Mr. Lloyd Martin and Dr. John A. Comstock of the Los Angeles County Museum.

The bulletin devotes 33 of its 52 pages to an annotated check list. It follows the order of McDunnough's Check List *(Mem. So. Calif. Acad. Sci.,* Vol. I, 1938) and retains the original numbering of species and lettering of races. This is a distinct advantage for those who have an orderly private collection. Localities, dates of capture, and collector are properly noted. A line denoting where the original description is published could have been added. The bulletin has twenty illustrations of butterflies in black-and- white. A sketch map of the park is marked with the localities mentioned in the text.

More illustrations—and in color—would be desirable. But this would add greatly to the cost of the publication, which is not intended for the advanced student of entomology but for the average person who likes to know something about the beautiful insects that come under his observation. For this purpose, it is a work well done.

EDWARD F. GUEDET

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BEES: *Their Vision, Chemical Senses, and Language.* By Karl von Frisch (Professor of Zoölogy in the University of Munich). Cornell University Press, Ithaca, New York. 1950. xiii + 119 pp., photographs, drawings, diagrams. $3.00.

In this book Karl von Frisch gives us the main results of his nearly forty years of study on the vision, chemical senses, and language of the honeybee. By means of many carefully planned experiments we learn, in brief, how the bee finds food and how it imparts this information to its fellow workers.

The first of the three chapters deals with the color sense and form perception of bees. This concerns chiefly the relationship of bees with flowers from which they secure nectar and pollen. Experiments show that the color sense in bees is not as good as ours, for while the visible spectrum for bees is extended into the ultraviolet, these insects are red-blind, and apparently see only four different qualities of color as against about sixty different colors visible to the human eye. Von Frisch concludes that "color is surely an important aid to bees in recognizing a particular kind of flower, but not an infallible guide . . . Hence they must have other means of distinguishing the different species of flowers with certainty." But experiments show that the perception of form in bees is not very well developed. They do seem to notice whether a figure is very much broken or compact. This probably helps some, but neither the color sense nor that and the form sense together serve the bee in recognizing flowers precisely.

This brings us to the second chapter, on the chemical senses of bees. The sense organs of smell—as well as organs of touch—are located in the last eight of the twelve segments of the antennae of the bee. The olfactory reactions in the antennae of bees and in the human nose appeared nearly similar notwithstanding the entirely different anatomy of the respective olfactory organs. Bees were able to distinguish the "sap spots" or "nectar guides"—that central part of the flower containing nectar and often differently colored and scented from the rest of the flower. "Often there was no difference in quality but an increasing intensity of odor around the entrance to the bottom of the flower where the nectar is located."*

The sense of taste in the bee is located in the mouth parts. As with man, the bee can distinguish sweet, salty, sour, and bitter tastes. Experiments showed that bees can distinguish between varying degrees of sweetness in a liquid and under rather poor conditions in the field will not accept solutions containing less than about 5 per cent sucrose.

In Chapter III, "The Language of Bees," Dr. von Frisch explains how bees tell their fellows about the presence of food at a new location. Glass-walled hives are used, and the scout bees identified by spots of colored paint. These bees returning from a source of food enter the hive, climb on a vertical comb, and there perform either a "round" or a "wagging" dance, depending upon whether the source of food is near or far. At intervals the dancing bees feed the other bees, now excitedly trooping behind them, with regurgitated nectar. The round dance, circling to the right and then to the left, with repeats, seems merely to say: Seek the food; it is near-by—and the bees fly out in search. In the wagging dance, the bees "run a short distance in a straight line while wagging the abdomen very rapidly from side to side; then they make a complete 360-degree turn to the left, run straight ahead once more, turn to the right, and repeat this pattern

*"Experiments carried out by Miss Mathilde Huber and Miss Therese Lex but not yet published" (author's footnote, p. 37).

over and over again . . ." If the dancer points directly upwards the food is towards the sun; if the straight run points directly down it is away from the sun; if the run points to one or the other side of the vertical the food is so many degrees to one or the other side of the sun.

Under normal conditions bees in the hive dance in the dark. Here it was found that the dances were executed with reference to gravity. "They orient the straight portion of the dance at the same angle to the force of gravity as the angle they have flown with respect to the sun during the flight from hive to feeding place . . ." This is possible even when the sun is hidden behind a cloud. The distance from the source of food is indicated by the number of turns in the wagging dance in a given time, the greater the distance the fewer the turns. The flower odor on the foraging bees, the regurgitated nectar, and a special glandular odor help the alerted bees find the source of food.

Bees perching on the horizontal landing platform of the hive will dance and point directly, compass-like, at the source of food. This happened also under controlled conditions.

The last part of the book deals with the nature of the bee's orientation by polarized sky light. It was found that bees on a horizontal surface could point directly towards the food even though only a portion of the blue sky was visible. But a cloud passing over this sky area would for the time dis-orient the bees' dancing. This led to the study of the polarization of light with reference to the bees' orientation. When a sheet of polaroid intercepting the sky light was so turned that the plane of vibration of polarized light was shifted, the dances of the bees deviated in the same direction. A model of an ommatidium, or single element of the bee's compound eye, was constructed of polaroid triangles, and "by control experiments with this artificial eye we showed that the direction of the dances always shifted by the same angle as that to which the brightness pattern in the sky was displaced under the particular conditions of the experiment." Thus, "the ability of bees to orient themselves by the polarization of sky light has been confirmed in a surprising fashion," and it seems probable that "the single ommatidium functions as an analyzer of polarized light."

This is a book of revelations, describing an outstanding example of research. It is a book for the interested reader and for the scientist. It is indispensable to the student of animal behavior. F. X. Williams

Department of Entomology
California Academy of Sciences
San Francisco

YOSEMITE FIELD SCHOOL

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FROM THE READER

(Continued from page 3)

in a climax forest need not ruin the spectacle of a primeval stand—and that he prefers the normal untidiness of a fallen senile tree (with young ones nourished by its substance growing up around it) to the managed neatness of a tree farm. And a thoughtful, unprejudiced person who has walked beneath the giants of the South Grove or Beaver Creek, his companions dwarfed in the vastness and his own footfalls silent in the forest duff, will tell you he hopes that that forest can be left without man's intervention, with nature taking its unmanaged course.

But in the end it comes down to how much money is available to make the purchase. Some funds have already been donated—either through the Save-the-Redwoods League or Sierra Club, or directly to the Calaveras Grove Association—but far greater amounts are necessary. School children's pennies and philanthropists' checks will be more readily contributed when the importance of the Calaveras acquisition is more fully appreciated.

How much development?

The quiet peacefulness of South Grove today is a result of its remoteness. With no road near, the visitor is spared the distraction of mechanical incongruities, and the primeval trail approach brings him into the grove in a mood of receptivity. Transition from a specific, hurried moment to a point in unmeasured time cannot be made in the few seconds it takes to step out of a car; but in an interval of leisurely trail travel one becomes more responsive to the essence of the timeless woods.

When the South Grove becomes a park there will be a great clamor for roads, food and housing concessions, curio shops, amusement devices, all sorts of introductions foreign to the present atmosphere. Each is worthy enough in its place, but when we think how many carnival-type resorts there are and how few Calaveras Groves, we approve heartily the recommendations that the South Grove be forever free of these spurious improvements.

It is not easy for park administrators to draw the line. If there is a park, people must get to it. But must they all come by car and be served as in a city? What is over-civilized for one visitor may be prohibitively rugged for another (and either will protest concessions to the other). One horn of the dilemma may seem less sharp if, in the determination of policy, the great number of miles of existing roads is weighed against the small number of roadless scenic areas, and if it is fully recognized that not only the greater number of Big Trees in the South Grove makes it more impressive than the North Grove, where development (though moderate and restrained) is close at hand.

A middle-ground solution recommended by Frederick Law Olmsted calls for good road to but not beyond attractive campsites a little less than a mile from the grove. From this road end visitors could go by gently graded trails into the heart of the grove with little effort. An illusion of remoteness may thus be preserved, and not denied to anybody capable of a little trail travel. Some physical effort may not be too great a price to pay for a visit to such a forest as this, a living museum exhibit of what our country used to be.

We can expect that tomorrow will bring as many cares as today, as much need for occasional quiet retreat in natural surroundings. Our generation has come to realize that the legacy from the past has too little of the world our pioneer ancestors knew; but it is still within our power to transmit to the future a few of the silent, green-lighted trails. All it takes is public understanding and help.

CHARLOTTE E. MAUK

Sierra Club, San Francisco, 22 January 1951.

The following is reprinted, with Editor David R. Brower's permission, from the Sierra Club Bulletin *of January, 1951 (p. 16):*

The wilderness reserves should not be sacrificed in advance of absolute necessity. Their integrity should not be jeopardized by permitting a breach, however small and innocent it may appear today, to be made in their lines of defense. Through that breach, step by step, can come the destruction of the wilderness.

HAROLD C. BRADLEY

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February 8—*"The Story of Helium"*—An element which was first discovered in the sun—will be told by Dr. Joel H. Hildebrand of the University of California.

February 15—*"Dinosaurs and Diamondbacks"*—A parade of living reptiles—compared with their ancestors who roamed the earth millions of years ago.

February 22—*"The Romance of Pharmacy"*—Drugs and medicines—their history and development—will be traced by Dr. Robertson Pratt of the University of California faculty. Dr. Pratt's Science in Action program on Penicillin was one of the most popular in the first series.

March 1—*"The Laws of Motion"*—The laws of motion are constantly with us in our everyday lives. A panel of San Francisco High School students will demonstrate various fundamental principles of physics.

March 8—*"Moles and Gophers"*—Dr. Tracy I. Storer, University of California faculty member, will take you on an underground tour of your garden.

March 13—*"How Television Works"*—The know-how of television shown by a behind-the-scene view of Science in Action.

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Our scientists equipped test engines with atomically treated rings; for the first time actually measured wear with Geiger counters, as it took place! Thus brand New "RPM" was developed.

Cold-operation tests simulated stop-and-go driving conditions. New "RPM" was compared with best conventional oils.* Results were startling! For New "RPM" was a star performer!

New RPM Motor Oil was shown to *double the life of average automobile engines* between major overhauls due to lubrication. Laboratory tests proved it. Severe road tests backed it up.

Finest engine insurance you can buy!

No motor oil gives you better protection than New "RPM." Compared with conventional motor oils,* it doubles the life of average engines between major overhauls due to lubrication. It cuts in half the wear-rate of such critical engine parts as piston rings and cylinder walls. It doubles protection against gummy carbon, acid, corrosion, rust and varnish... maintains the low-oil-consumption life of the average engine twice as long. Sold with a money-back guarantee of satisfaction.

NEW RPM REG U S PAT OFF MOTOR OIL

*"*Premium Type" oils as designated by the American Petroleum Institute.*

CHEVRON GAS STATION

STANDARD STATIONS INC.

We take better care of your car